REORGANIZATION

Number 2s try harder

BY SHARON SCULLY
Senior Editor

The recently announced reorganizations of Harris Corp. and Siemens Information Systems (SIS), a subsidiary of Siemens AG of West Germany, signal an industry trend that finds second-tier suppliers forced to piece together enterprises that can more aggressively market packaged equipment and network services to large business users.

Both Harris and SIS detailed, at the International Communications Association (ICA) conference in Atlanta, reorganizations aimed at integrating the marketing of their communications and information

See **Harris/Siemens** page 6

NETWORKING ISSUES

IBM talks standards

Many people view IBM and standards as the equivalent of oil and water: The two just don't mix. IBM claims that situation is changing, and the company has taken a more active role in the quest to tie systems together. Richard J. Holleman, director of standards practices at IBM, coordinates standards work undertaken by various IBM divisions.

In Boston to present the keynote address at last week's Network Management/Technical Control Conference and Exposition, Holle-

See **Q&A** page 8

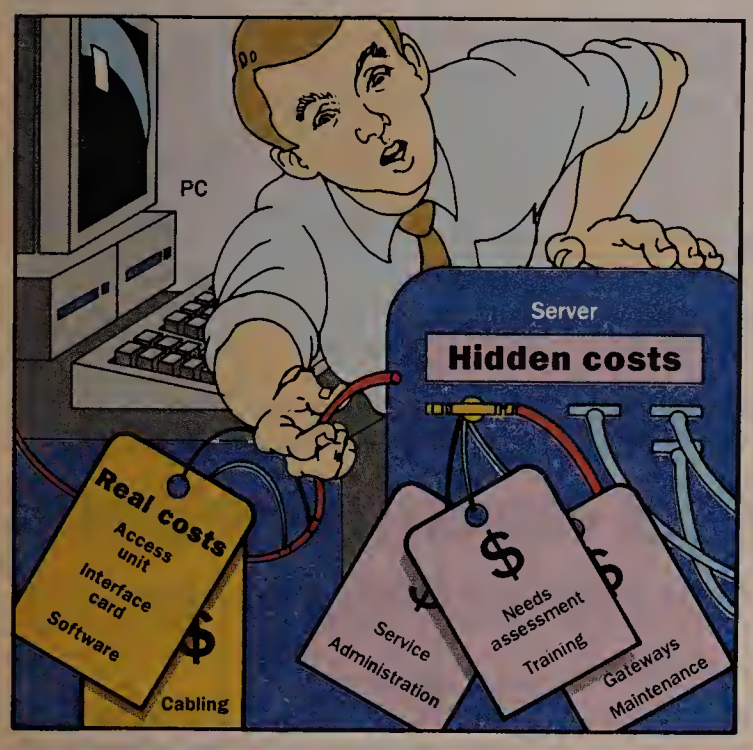
NETWORK WORLD

THE WEEKLY FOR LEADING USERS OF COMMUNICATIONS PRODUCTS & SERVICES VOLUME 3, NUMBER 15 JUNE 16, 1986

PC CONNECTIONS

Hidden expenses hike local net installation costs

Unforeseen outlays can surprise unwary users.



BY MARY PETROSKY
West Coast Correspondent

Ask vendors how much it costs to install personal computer networks, and the usual answer is $1,000 to $1,200 per connection. But users tell a different story. They talk of a Pandora's box of hidden expenses that can triple or even quadruple the cost.

Among these hidden or so-called soft costs are expenditures for end-user training, network maintenance and administration outlays and the time and money spent on needs assessment and product analysis. Linking the local net to other computing resources, such as mainframes, can add additional, unfore-

See **PC nets** page 7

OFFICE SYSTEMS WARS

DG bolsters Disoss link

Mini maker embraces Snads, hooks to host library services.

BY PAUL KORZENIOWSKI
Senior Writer

WESTBORO, Mass. — One-upmanship remained the order of the day in the office automation arena as Data General Corp. last week significantly enhanced its support for IBM's Disoss.

DG fine-tuned its CEO/Document Exchange Architecture (CEO/DXA) interface, which links the company's family of Eclipse MV superminicomputers to IBM processors running Disoss. CEO is an integrated package that includes word processing, electronic mail, electronic filing, calendar management and decision support applications.

The enhancements enable DG Eclipse MV users to work

See **DG** page 5

NETWORK LINE

News

Artel Communications reaps the fruits of its labor with the debut of a high-speed fiber-optic local net called Fiberway. Page 2.

▼

K mart signs on as an early user of GTE Spacenet's Vsat service. K mart's satellite net is expected to save the retailer $4 million to $5 million per year. Page 3.

▼

Infotron may have jumped the gun in discussing details of its deal with Siemens to reserve desktop space in future ISDNs. Page 4.

▼

CWA President Morton Bahr calls AT&T desperate and frightened. But some say those words describe the CWA in its effort to hold out for a better deal. Page 6.

▼

Choosing the wrong LAN can be the beginning of a nightmare. Page 8.

▼

Legislation that would give postdivestiture authority to the FCC could signal a shift in government intervention in the telecom industry. Page 9.

▼

RCA Americom fights back with the introduction of its first small dish antenna satellite service. Page 11.

▼

Features

The 2,400 bit/sec modem is flexing its muscles at the expense of the 1,200 bit/sec unit. The winners in the fight are those who sell both. Page 24.

▼

Key and hybrid system manufacturers are making it tough to tell whether they're selling fish or fowl. Page 27.

NEWSPAPER

FEATURE FOCUS

What you don't know can hurt you

Know your copyright laws.

BY ARNOLD B. SILVERMAN
Special to Network World

First of a two-part series.

By legal standards, the use of communications networks for voice, video and data applications has grown too rapidly.

As a result, still-evolving software copyright laws represent a patchwork effort to embrace computer technology within intellectual property law.

And that effort has left continuing uncertainties among users and vendors.

Continued on **page 31**

▶ ARTEL COMMUNICATIONS

Fiber-optic LAN debuts

Fiberway offers coax cable alternative.

BY JOHN DIX
Senior Editor

NEW YORK — A high-speed local-area network that combines fiber optics and conventional twisted-pair wire was released here last week by Artel Communications Corp. The network provides a simple wiring alternative to coaxial cable for data devices and demanding applications such as computer-aided design and manufacturing (CAD/CAM).

Fiberway is the fruit of a $3.5-million, 2½-year development effort and represents a significant new direction for the five-year-old company, according to Tad Witkowicz, president and chief executive officer. Artel, which made its mark in point-to-point fiber-optic communications products, had $6-million in revenue in 1985.

Fiberway is a digital, broadband, 100M bit/sec ring network that consists of two major components: Node Concentrators and Ring Interface Units. Fibers are used to connect the Node Concentrators, which are installed in wiring closets located around a campus or on each floor of a high-rise building. The concentrators use twisted-pair wire to support the Ring Interface Units located in or near end users' offices.

The Node Concentrators divide the 100M bit/sec fiber into four 25M bit/sec time division multiplexed bands.

These high-capacity bands can be employed individually to support a type of service, such as high-speed support for CAD/CAM equipment, or they can be subdivided to support lower speed devices.

In the latter implementation, Node Concentrators on a 25M bit/sec band can support up to eight 2.7M bit/sec channels terminated by Ring Interface Units. The Ring Interface Units are attached with a single twisted-pair wire at distances up to 1,000 feet. The Ring Interface Units, in turn, can support up to eight devices.

Because Fiberway can use twisted-pair wire for horizontal distribution runs between wiring closets and offices — wire that is already in place in many instances — the only fiber installation required is between wiring closets.

Three types of Ring Interface Units are provided: the Artel EXL50 for devices with IEEE 802.3 Ethernet-type interfaces; the RIU232 for asynchronous equipment with RS-232 interfaces; and the RIU3270 for IBM 3270-type terminals.

Although the 2.7M bit/sec speed limit of the link between the concentrator and interface units would seem to degrade the performance of equipment attached through 10M bit/sec Ethernet interfaces, Witkowicz said Fiberway delivers

See **Fiberway** page 34

▶ INDUSTRY INSIDER

IBM to unleash product barrage?

BY JOHN DIX
Senior Editor

IBM is expected to unveil next week a truckload of new products both in New York and at the 1986 National Computer Conference in Las Vegas. The introductions will probably revolve around IBM's minicomputer and 3270 peripheral lines and include software upgrades aimed at improving communications among its office systems and a slew of new 3270 peripherals — perhaps even the long-rumored replacement for the 3274 controller.

"All indications are that IBM is trying to make this a blockbuster of an announcement," said Mike Chuba, an analyst with The Gartner Group, Inc., a Connecticut-based research firm.

In the parlance of the trade, analysts expect this to be a "100-page plus ivory sheet introduction." IBM's product detail literature is printed on ivory colored paper.

While specifics about the introductions are scarce, industry observers believe IBM will finally announce a new line of 3270 terminal products. Speculation was mixed as to whether the announcements will actually include the 3274 controller replacement. Frank Dzubeck, president of Communications Network Architects, Inc., a Washington, D.C. consulting firm, would not speculate, but said the replacement has been undergoing tests at a number of sites and the industry is "ripe for its introduction."

Ilene Goldman, manager of the workstation program at International Data Corp., a Framingham, Mass.-based research company, says IBM will announce a new line of terminals called the 3190.

George Colony, president of the Cambridge, Mass.-based consultancy Forrester Research, said he expects to see software and connectivity boosts for the System/36 and System/38 minis.

Table of contents

TOP NEWS

The reorganizations of Harris Corp. and Siemens signal an industry trend for second-tier suppliers. **Page 1.**

IBM's director of standards talks frankly about the role of IBM in the communications standards movement. **Page 1.**

Hidden expenses can triple the cost of local-area nets. **Page 1.**

Data General enhances its Disoss interface to support Library Services, Snads and PU 2.1. **Page 1.**

INDUSTRY UPDATE

If passed, a Senate bill will hand control of divestiture to the FCC and may signal an overall industry regulation change. **Page 9.**

TELECOM TRENDS

RCA Americom answers threats to its main businesses with Microstar Networking Services, a strategic entry in the Vsat market. **Page 11.**

DATA DELIVERY

Terminal emulation boards are selling in record numbers. What's the cause? **Page 13.**

FACTORY COMMUNICATIONS

Electronic Data Services builds a massive, worldwide network to link GM facilities. **Page 15.**

COMMUNICATIONS MANAGER

For crafty Steve Esselstyne, manager of Stanford University's user network, there is no shortage of talented industry technicians. **Page 17.**

NEW PRODUCTS AND SERVICES

BBN Communications releases security features to fortify its X.25 network. **Page 19.**

FEATURES

Vendors attempt to breathe new life into 1,200 bit/sec modem sales by adding new features. **Page 24.**

Today's under-100-line telephone system market includes electronic key systems, hybrids and mini-PBXs. **Page 27.**

▶ NET MANAGEMENT

Automated net-design tools ease optimization

Products span micros to mainframes.

BY MICHAEL FAHEY
Staff Writer

As communications networks become more complex and telephone tariffs are changed more frequently, users need more sophisticated and reliable network design and optimization tools.

Communications managers need to predict accurately the effect of adding new locations to their networks. They also must evaluate tariff shifts, gauge the effect of routing changes and predict the effect of changing technology on their networks. All of these are complex tasks, made more so by the divestiture of AT&T. Because of this, communications managers are increasingly turning to computerized tools for designing, optimizing and managing their voice and data networks.

Three types of net tools

There are three basic types of network tools available: time-sharing services based on vendor mainframes, programs that run on customer mainframes or supermicro computers and applications for personal computers.

These systems enable users to build replicas of their networks in software and perform economic and performance evaluations to achieve optimal network configurations. The systems enable users to pose "what if" questions concerning parameters such as response time, network topology and the latest changes in service tariffs.

Vendors of mainframe-based services maintain that their products are best for users with large networks requiring complex tariff analysis and frequent updates.

"If you need a firm quote and a lot of information about a given location, especially tariff information that is changing, the only valid method is a centralized time-share arrangement," said Ed Warner, executive vice-president of Aries Group, Inc., a Rockville, Md.-based consulting firm that markets a network design and analysis service.

According to Gene Sachsenmaier, director of planning and services at Contel Business Networks, these systems are constantly up-

See **Tools** page 5

▶ EARLY USER

K mart leads Vsat pack

BY BOB WALLACE
Senior Writer

TROY, Mich. — K mart Corp., which recently signed on as one of the first users of GTE Spacenet Corp.'s fledgling very small aperture terminal networking service, expects to save between $4 million and $5 million per year by replacing existing communications networks with a 2,000-site Vsat net that also uses packet-switching equipment.

K mart inked a $40-million pact with GTE Spacenet of McLean, Va., and GTE Telenet Communications Corp. of Reston, Va., for Vsat services that will significantly reduce the time and cost involved in authorizing credit card transactions at K mart's retail outlets. The net will allow electronic cash registers to transmit credit card transaction information quickly to both Visa and MasterCard credit authorization headquarters.

By speeding transaction processing, the Vsat net will allow K mart to reduce its payments to credit card companies. K mart will pay each company a smaller percentage of each transaction's dollar amount. A spokesman for K mart claimed the reduction in transaction authorization time will also shorten cash register lines at the company's stores.

Under the agreement, K mart will subscribe to GTE Spacenet's fledgling Skystar Interactive Data Network Service and purchase roughly 2,000 1.8-meter Vsats ("Vsat service announced," *Network World*, June 6). GTE Spacenet will construct the system's hub earth station, which will be located near K mart corporate headquarters here. K mart will lease transponder space on one of GTE Spacenet's G Star, Ku-band satellites.

GTE Telenet will provide K mart with packet assembler/dissassembler (PAD) equipment for each Vsat location, as well as packet switches and network management and control equipment that will be housed at K mart's corporate headquarters. K mart's network management control system will consist of a series of 32-bit minicomputers and color graphic displays. The system will provide visual alerts when a link has failed and produce a trouble ticket for each problem.

Once the Vsat net is operational, the credit card transaction information will be converted to the X.25 protocol and packetized by PADs at each store. The Vsat will beam the information up to one of GTE Spacenet's G Star satellites at 56K bit/sec. The data will then be beamed down, at the same speed, to the hub station and to GTE Telenet packet switches here, which will route the data to the correct mainframe. The transaction will then be sent to either a Visa or a MasterCard authorization center via leased line.

Once the transaction has either been approved or disapproved, the results of the query will be sent back across the leased line, through the packet switch, up to the satellite and back down to the Vsat at the K mart store.

Alan Taffel, network systems sales director for GTE Telenet, said

See **K mart** page 5

▶ CO SERVICES

Centrex blends the old and new

Meets new demands without axing predivestiture strengths.

BY KARYL SCOTT
Washington, D.C. Correspondent

ARLINGTON, Va. — Locked in a competitive dogfight with private branch exchanges, Centrex has somehow managed to keep up with user demand for more sophisticated telephone services, while maintaining the predivestiture-era features users like best.

Centrex combines the ease of service associated with telecommunications' old days with information age enhancements such as voice/data capabilities, according to Thomas Cross of Cross Information Co. in Boulder, Colo. Cross spoke at a conference last week on the future of Centrex, which was sponsored by telecommunications publications *BOC Week* and *Telecommunications Alert*.

For users that wish to leave the onus of setting up a telephone system to the telephone company, Centrex allows them to take advantage of telephone company network expertise and installed central office equipment. Centrex also provides a degree of control over the network for those users who demand that capability.

Innovative pricing schemes brought on by Centrex deregulation and additional functionality offered recently by equipment manufacturers helped rescue Centrex from the ashes. Within the past year, Centrex has enjoyed a ground swell of renewed user acceptance.

But despite the continuing pitched battle between PBXs and Centrex, there are numerous advantages to users opting for the increasingly popular Centrex offerings, said Cross, who counsels customers on system purchases. But he also warned that there are risks and disadvantages that should be considered.

Users have realized that one of the biggest advantages is that Centrex helps them avoid large capital expenses. When a firm buys a PBX, it must pay a large lump sum up front, often having to borrow to make the purchase. The ongoing costs of maintaining the PBX, paying staff to run it and financing software ugrades are expenses that Centrex users are able to avoid.

In addition to the equipment costs associated with a PBX, there are hidden costs that most users don't realize until a system has been installed. Those costs include electricity to run the PBX, space costs for the room that houses the PBX and air-conditioning equipment to maintain a cool environment. "These costs alone are enough to convince many users to go the Centrex route," Cross said.

Centrex, like all other BOC network services, has built-in redundancy so that if a system failure occurs, there is a backup to maintain service.

"Centrex is very attractive for shared tenant users," Cross said. "It's good for organizations with multiple locations and for businesses that have seasonal expansions and contractions. The size of the user's telephone network can be changed to suit the changing calling needs of a business cycle."

One of the disadvantages a prospective Centrex buyer should be aware of is that BOCs can make promises about upcoming feature enhancements that may never materialize. Cross also questioned the ability of a voice system such as Centrex to adequately handle local-area networking needs.

The BOCs have been able to make Centrex more economically appealing because of a loosening of regulatory requirements, but that could change in the future.

▶ REGULATION

Cincinnati Bell to refund $20m

BY MARGIE SEMILOF
Senior Writer

CINCINNATI — Local telephone company customers here will be the first to benefit directly from a recent U.S. Supreme Court ruling that wrested from the Federal Communications Commission the authority to dictate depreciation schedules that play a part in telephone rate calculations.

Last week the Ohio Supreme Court ordered Cincinnati Bell to refund more than $20 million to customers for overcharges collected between 1983 and 1985.

The refund decision stems from a rate increase Cincinnati Bell filed for in 1982. In 1983, the Ohio Public Utilities Commission granted Cincinnati Bell the $22.5-million rate increase, which was based in part on FCC-determined equipment depreciation schedules.

Soon after the rate hike was approved, several consumer groups challenged the filing, and the Ohio Public Utilities Commission later rescinded its decision. Cincinnati Bell appealed the case to the Ohio Supreme Court, but continued to charge the higher rates.

The Ohio Supreme Court last week determined that the U.S. Supreme Court decision — which gave control over depreciation schedules back to the state — applied to the Cincinnati Bell appeal and rejected the case. The Ohio Supreme Court is now responsible for deciding how Cincinnati Bell will distribute the $20-million refund to its customers. Analysts predict the refund may amount to an average of $40 per customer per line.

Shorter equipment depreciation schedules generally increase telephone rates. If a telephone company writes off its equipment investments too quickly, its end-of-year earnings will be decreased, giving it justification for raising its telephone rates.

Telephone companies try to depreciate equipment as quickly as possible to avoid being saddled with outmoded equipment. Public utility commissions, in a quest to keep their constituents happy, seek longer depreciation schedules so customers can have lower monthly phone bills.

Like Cincinnati Bell, other local operating companies may be doling out substantial rebates to customers if state supreme courts deem the FCC-imposed, state equipment depreciation rates unlawful.

However, Tom Spavins, deputy chief of the FCC's Office of Plans and Policy, said not all states found the FCC depreciation rates to be unreasonable. But, he said, most states thought the FCC should have turned control of depreciation rulemaking over to them.

Officials from Cincinnati Bell said the refunds will have no effect on current prices and services. But, according to Spavins, although the Cincinnati users will get a refund, the telephone company may have to raise its monthly service rates to cover the expense. "If a telephone company is ordered to pay a one-time refund, its expenses will be higher because the equipment must still eventually be depreciated."

Cincinnati Bell spokesman Chuck Shawver said his company has $10 million in escrow that will be put toward the refund.

▶ AT&T

New Unix version debuts

BY BOB WALLACE
Senior Writer

LAS VEGAS, Nev. — AT&T is expected to announce tomorrow at the 1986 National Computer Conference (NCC) a new version of its Unix System V operating system that features significantly boosted communications capabilities. AT&T will also introduce at NCC a Digital Multiplexed Interface (DMI) that links its 3B5 computers to digital private branch exchanges.

Unix System V Release 3.0 networking enhancements reportedly allow users to share data, applications and resources such as printers among a series of processors. To users, it appears as though the data and resources are based on the same machine. The features can be used over AT&T's 1M bit/sec Starlan local-area network and the fiber-optic cable-based Information Systems Network.

Jack Scanlon, group vice-president of AT&T's computer systems organization, claimed, "The new version of the Unix operating system allows a user to move data and files among computers without worrying about the underlying protocols or network hardware requirements."

Unix System V Version 3.0's Remote File Sharing (RFS) feature enables a user to share files and peripheral devices such as printers and plotters connected to the same network. In addition, the operating system's new Streams feature allows RFS to operate over networks regardless of the transmission media or network protocol they use.

AT&T is also expected to unveil later this month software that provides an interface between Unix and Microsoft Corp. MS-DOS messaging systems.

Doug Gold, a senior communications software research analyst with International Data Corp. of Framingham, Mass., recently witnessed a demonstration of Unix System V Version 3.0. He said he was uncertain if the system's networking features will boost its popularity. "The Streams and the Remote File Sharing capabilities are certainly a terrific idea," Gold explained. "But I think it's too soon to tell whether the operating system's networking capabilities will make as big an impact on the networking world as AT&T seems to think they will."

AT&T spokesman Martin Nabut said six current Unix licensees will implement the new version of the operating system on their processors. This group includes Amdahl Corp., Apollo Computer, Inc., Convergent Technologies, Inc., Gould, Inc., NCR Corp and Pyramid Technology Corp. Other vendors, including Fairchild Industries, Intel Corp., Motorola, Inc. and National Semiconductor Corp., are porting the operating system to their 32-bit microprocessors, Nabut claimed.

Interactive Systems, Inc., Quotron System, Unisoft System Corp., Venturcom, Inc. and Wollongong Group plan to develop applications for Unix V Version 3.0, he added. AT&T claims it will become the standard operating system for all Unix-based AT&T computers.

DMI is a data interface designed to connect a digital PBX with a host computer. It is compatible with the CCITT's Integrated Services Digital Network primary rate interface. Unix System V Release 3.0 is available immediately in source code for developers. It is also available in binary form on AT&T 3B2 computers. AT&T's DMI interface boards for the 3B5 computer are currently under controlled release. The cost for the interface is $9,000.

▶ ISDN

Infotron jumps the gun

BY SHARON SCULLY
Senior Editor

CHERRY HILL, N.J. — Infotron Systems Corp., a vendor that has been fighting its way onto U.S. public telephone networks since 1968, last week revealed its plan to win desktop space in future Integrated Services Digital Networks.

But the company may have spoken too soon in announcing a letter of intent it signed last week with the public switching division of Siemens Communication Systems, Inc. (SCS). Infotron was certainly eager to publicize its plan to manufacture and market an adapter board that would plug into existing personal computers and desktop terminals and bring 2B+D transmission capabilities to desktops networked to Siemens EWSD central office switches.

But Siemens officials said last week they were not ready to discuss the agreement, and in fact were "still discussing similar agreements with other companies."

In discussing the agreement, Daryl Eigen, manager of technical marketing with Siemens Communication Systems, said the adapter boards were, in fact, developed by SCS.

"We were looking for a company to manufacture and distribute the ISDN equipment that really has a feel for the data communications marketplace in the U.S.," Eigen said.

"Infotron seemed to be a good company in that respect."

The agreement marks the first time SCS, the public network switching subsidiary of the West German conglomerate, has ventured into the customer equipment market.

Eigen said the company would pursue similar agreements with customer premises equipment manufacturers and distributors, "but in other ISDN product areas."

Also, he said SCS is discussing similar joint development projects with its sister subsidiary, Siemens Information Systems, which sells only in the customer equipment markets.

"We're trying to stimulate demand for ISDN services in the U.S.," Eigen said. SCS announced it would bring its EWSD digital central office switch to the U.S. marketplace a little more than a year ago. At that time, the effort was given little credence among industry analysts and vendors.

"SCS initially approached the industry and tried to get vendors to develop ISDN terminal equipment and terminal adapters to go with our [central office] switch," Eigen said.

"But the response was 'Hey, there aren't any standards and it's a big risk.' And the vendors were right. For the most part, the [customer premises equipment] vendors are pretty small. At that time, nobody thought Centrex was really going to make a go of it. Nor were people convinced Siemens would make it in the U.S."

Since then, Siemens has announced its EWSD switch will be used in the ISDN field trials announced to date by Ameritech, Nynex Corp., Bell Atlantic Corp. and BellSouth Corp. In addition, the switch has been certified for public network use by Bell Communications Research, Inc. and approved by Ameritech for its next round of procurement.

"The bottom line was, if we wanted to sell ISDN in the U.S., we would have to make some of the initial customer premises equipment ourselves to connect with our switch, our ISDN," Eigen said.

For Infotron, the announcement made clear yet another plug-in-the-dike strategy with which equipment and networking vendors today are trying to survive the coming flood of ISDN competition from end-to-end vendors.

According to Gary Bacon, director of carrier marketing for Infotron, Infotron is one of only two companies now committed to building ISDN terminal adapters. He said Fujitsu America, Inc., which recently announced it would provide ISDN terminals for use in the Ameritech/McDonald's Corp. ISDN field trial in 1987, "is building a terminal, not an adapter.

"But most users aren't going to want to throw away all the data terminals and PCs they've already bought," he said.

Bacon said he expected that initially the adapters would sell in the same price range as intelligent data sets, which now range from $700 to $1,300.

"The company that uses these terminal adapters today will get the benefits of ISDN without having to buy ISDN terminals," Bacon said.

NETWORK WORLD

Box 9171, 375 Cochituate Road
Framingham, Mass. 01701-9171
617/879-0700

Editor
Bruce Hoard
Managing Editor
John Gallant
Features Editor
Steve Moore
Associate Editors
Kathleen M. Cahill
Lisa Guisbond
Senior Editors
John Dix
Sharon Scully
Senior Writers
Paul Korzeniowski
Margie Semilof
Bob Wallace
Staff Writers
Michael Fahey
Nadine Wandzilak
New Products Editor
Jim Brown
Washington, D.C. Correspondent
Karyl Scott
1273 National Press Building
529 14th Street NW
Washington, D.C. 20045
West Coast Correspondent
Mary Petrosky
1060 Marsh Road
Suite C-200
Menlo Park, CA 94025
Assistant Features Editors
Christine Casatelli
Robert Mitchell
Copy Editors
Josh Gonze
Nicolene Hengen
Beth Lazarus
Susan Tanona
Art Director
Dianne Gronberg
Informational Graphics Designer
Alan Hopkins
Assistant to the Editor
Cheryl Tynan

Publisher
F. Douglas DeCarlo
Administrative Assistant to the Publisher
Mary Fanning

Production Director
Peter Holm
Production Manager
Marlene Stibal
Production Assistant
Stephen DeLacy
Pasteup Manager
Patricia Gaudette
Typesetting Manager
Carol Polack

Board Chairman
Patrick J. McGovern
President
W. Walter Boyd
Executive Vice President
Lee Vidmer
Senior VP-Communication Services
Jack Edmonston
Group VP-Circulation
Margaret Phelan
VP-Finance
William P. Murphy

Second-class postage paid at Framingham, MA, and additional mailing offices. *Network World* (USPS 735-730) is published weekly, except for a single combined issue the last two weeks in December by CW Communications/Inc., 375 Cochituate Road, Box 9171, Framingham, MA 01701-9171.

To apply for a free subscription, complete and sign the qualification card in this issue or write *Network World* at the address below. No subscriptions accepted without complete identification of subscriber's name, job function, company or organization. Based on information supplied, the publisher reserves the right to reject non-qualified requests.

Non-qualified subscribers: $3.00 a copy; U.S. — $65 a year; Canada, Central & South America — $110 a year; Europe — $165 a year, all other countries — $245 a year (airmail service). Four weeks notice is required for change of address. Allow six weeks for new subscription service to begin.

Four weeks notice is required for change of address. Please include mailing label appearing on front cover of the publication.

Network World can be purchased on 35mm microfilm through University Microfilm Int., Periodical Entry Dept., 300 Zebb Road, Ann Arbor, Mich. 48106.

Network World is distributed free of charge in the U.S. and Canada only to qualified management or professionals who specify and maintain communications equipment and systems, including voice, data and video, as well as to common carriers, consultants, systems houses and manufacturers of communications equipment.

PHOTOCOPY RIGHTS: Permission to photocopy for internal or personal use or the internal or personal use of specific clients is granted by CW Communications for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of $3.00 per copy of the article, plus $.50 per page is paid directly to Copyright Clearance Center, 21 Congress Street, Salem, Mass. 01970.

Permission to photocopy does not extend to contributed articles followed by this symbol. ‡

POSTMASTER: Send Change of Address to *Network World*, Box 1021, Southeastern, Pa. 19398-9979.

Copyright 1986 by CW Communications/Inc. All rights reserved. Reproduction of material appearing in *Network World* is forbidden without written permission. Special requests for reprints and permissions only should be addressed to Nancy M. Shannon, CW Communications/Inc., 375 Cochituate Road, Box 9171, Framingham, Mass. 01701-9171.

"ABC membership applied for"

ABP

▶ NATIONAL COMPUTER CONFERENCE

Fiber link planned for 3Com network

BY JIM BROWN
New Products Editor

LAS VEGAS, Nev. — 3Com Corp. is expected to announce at this week's 1986 National Computer Conference here a joint marketing and manufacturing agreement with Codenoll Technologies, Inc. aimed at the development of a fiber-optic option for 3Com's Ethernet-type local-area networks.

Under the terms of the agreement, Yonkers, N.Y.-based Codenoll will install fiber-optic transceivers on Mountain View, Calif.-based 3Com's Etherlink expansion board, which links personal computers to 3Com networks.

The new product, expected to be called Fiberlink, will convert electrical signals to lightwave impulses and allow personal computers access to Codenoll's Codenet fiber-optic local net.

Codenet is a passive star local-area network running under 3Com's 3+ operating system.

Fiberlink is expected to eliminate the need to run a coaxial or twisted-pair cable from a personal computer to a separate fiber-optic transceiver/converter box in order to link the personal computer to a fiber-optic local-area network. The $995 Fiberlink board is expected to be offered through 3Com's nationwide marketing organization, which includes nearly 1,200 retail outlets and personal computer manufacturers.

3Com officials would not comment on the pending announcement.

Without confirming that the joint deal would be announced, Ernest Raasch, Codenoll's executive vice-president of operations, said his company is looking to produce such a product. The agreement is expected to benefit both firms by adding an alternative transmission medium to 3Com's networking capabilities, while Codenoll stands to gain from exposure through 3Com's national distribution channels.

Fiber-optic lightwave impulses will reportedly yield a 400% to 500% increase in network distance over coaxial cable and offer greater bandwidth than coaxial cable.

Fiber-optic cable is also immune to electromagnetic and radio frequency interference attracted by the copper elements in coaxial cable. Such interference causes data errors and slows network speed by forcing error-detection devices to retransmit data.

"A network that has high error rates is really no network at all," Raasch said.

"The rationale behind the product is to make the immunity of fiber optics available to users of personal computers," he added.

A Codenet local-area network consisting of 92 miles of data-carrying fiber-optic cable has been strung throughout Southwestern Bell Telephone Co.'s 44-story St. Louis, Mo., headquarters.

Tools from **page 2**

dated and provide users with the latest information. Contel Business Networks markets the Mind-Data system, a mainframe-based time-share network analysis tool.

"Very frequently we will put up a prototype version of a tariff filing before we formally release the system. You cannot do that when you have a thousand customers that you have to ship floppy disks to," Sachsenmaier said. "And frankly, we can't do that for our customers with their own mainframe facilities."

Users with a great many network end points may wish to customize network software design tools. JCPenney and American Airlines, for example, have installed systems on their own mainframes, Sachsenmaier said. One large Contel Business Networks client, however, employs the company's time-share arrangement because, according to Sachsenmaier, that client "needs absolute, instantaneous, accurate updating."

Telco Research Corp. uses a slightly different approach in its network design and analysis services. The Nashville-based company offers a network analysis tool that runs on a Digital Equipment Corp. MicroVAX II that users can buy or lease. In addition, Telco Research will install the equipment at its offices and give users unlimited privileges for a fixed monthly fee.

Time-sharing service providers and vendors of customer premises-based mainframe and supermicro analysis tools maintain that their systems are superior to personal computer software packages when it comes to analyzing large networks.

> *"Users with a great many network end points may wish to customize network software design tools."*

Personal computer-based analysis tools, however, can be used to evaluate large networks by breaking the network down into smaller geographic units or according to their applications, said Cheryl Cushing of Connections Telecommunications in West Bridgewater, Mass. Connections Telecommunications markets a personal computer based product.

Connections, and most other vendors of personal computer analysis tools, also enables users to access a data base to download information about new tariffs when needed.

Although vendors of mainframe and supermicro solutions claim their systems are more robust than systems based on personal computers, many of these companies are also coming out with micro systems. Contel Business Networks and Aires both recently announced personal computer software packages.

Because of the great differences in services offered, prices for network design and analysis systems vary greatly. A large user could spend as much as $120,000 for a customer premises mainframe software system, plus a 10% to 15% annual maintenance and updating fee. A time-sharing arrangement may cost half that amount. At the lowest end of the price spectrum, some personal computer software packages cost less than $500.

K mart from **page 3**

the company will train K mart employees in the operation of the net management equipment. He said GTE employees will also remain at K mart headquarters to aid in operation of the network.

The GTE Telenet packet switch at the hub station location will be connected to GTE's Telenet public data network, Taffel explained. In the event of a hub station failure, traffic would be routed to and from the K mart stores over the public data network.

Walter Bzdok, senior director of corporate telecommunications services for K mart, said the company examined a variety of terrestrial network solutions, but opted for the combined Vsat, packet-switching solution for several reasons. "Vsat technology is far less expensive for us than terrestrial solutions," he explained. "One capability the Vsat system brings us that terrestrial solution vendors could not offer was the opportunity to run one-way video applications, such as video conferencing, over the satellite."

K mart will undertake a 50-store Vsat pilot project this winter. "If the pilot is successful, we will begin installing Vsats at the rate of 50 per month next spring," Bzdok claimed. The Vsat network is expected to be completed in 1990.

Bzdok said the mammoth Vsat system will replace several existing networks comprising a variety of leased lines.

DG from **page 1**

with Disoss Library Services and to participate as Systems Network Architecture Distribution Services (Snads) node through support of Physical Unit 2.1 and LU 6.2 protocols.

The announcement follows on the heels of Wang Laboratories, Inc.'s Disoss-related announcements ("Wang builds Disoss bridge," *Network World*, June 2), which helped Wang make up ground lost to arch-rival DG. But DG said its announcement last week gave it a new edge. The company now claims to be the only vendor other than IBM to offer both Snads and PU 2.1 support.

Disoss is an application program that runs under IBM's CICS teleprocessing monitor and provides two types of services. Disoss Distribution Services enables users to exchange documents in a manner similar to electronic mail. Disoss Library Services enables users to store documents on an IBM host. By using various Disoss features, users are able to search for and retrieve documents.

The first version of CEO/DXA, announced in August 1985, interfaced with Disoss through IBM's Document Content Architecture (DCA) and Document Interchange Architecture (DIA) standards for document formating and exchange. DIA and DCA support two types of documents. Final form documents can only be read or printed, while revisable form documents can be modified by users. The first release of CEO/DXA supported both types of documents.

Disoss Distribution Services uses two techniques for routing documents: DIA or Snads. The first version of the DG software supported DIA, which is not as robust as Snads. For example, when more than one user requires a document, DIA mails each user his own copy of the document. Also, whenever a new Disoss user is added to a system, the host Disoss file has to be updated.

Snads is an SNA document store-and-forward service. For multiple mailings, Snads sends one document to a node where users can access it rather than sending a document to each user. Also, users can be added to a node without requiring host files to be updated.

With the enhancements, CEO/DXA enables Eclipse/MV users to participate in hierarchical Disoss networks as well as distributed Snads networks. With Snads capabilities, a DG superminicomputer can act as a central Disoss node and send, receive and store Disoss documents.

A new Application Program Interface (API) LU 6.2 enables programs written in DG's AOS/VS Cobol, Fortran, PL/1 or Macro Assembler languages to interact with other programs following the LU 6.2 protocol.

To support the new product, a CEO system must run other DG programs such as DG/SDLC, DG/XDLC and DG/SNA. Prices for CEO/DXA range from $1,500 to $9,000. API LU 6.2 costs between $1,500 and $7,200.

▶ COMMUNICATIONS INDUSTRY

CWA, AT&T hang tough

BY KARYL SCOTT
Washington, D.C. Correspondent

WASHINGTON, D.C. — The Communications Workers Association (CWA) last week took a more militant stance against AT&T as the union ended the second week of its strike against the telecommunications giant. But indications are the strike has not severely affected telephone service.

The CWA stepped up its rhetoric campaign against AT&T, criticizing the company's contract offer and negotiating tactics. As of last Thursday, negotiations had recessed, and AT&T was waiting for CWA to reply to its latest offer. A mediator met separately with CWA and AT&T negotiators early last week.

In strongly worded statements, CWA President Morton Bahr called AT&T "desperate" and "frightened." But some observers say those terms describe more accurately the CWA, which has seen its negotiating power diminish in the competitive telecommunications environment. Its position was also weakened by the International Brotherhood of Electrical Workers' recent acceptance of an AT&T contract similar to the one under fire from the CWA.

The CWA has been making what many observers termed exaggerated claims concerning the effect the strike is having on AT&T's business. The CWA claimed last week that AT&T was losing about $60 million per day, and it cited research that suggested the strike was causing deterioration of AT&T's long-distance service.

The CWA said a telephone survey it commissioned showed that more than 10% of attempted operator-assisted calls took up to 45 seconds to be answered. But AT&T said its survey found that there was an average 10-second delay.

AT&T last week disagreed with the CWA's claims that the company was losing millions. In fact, industry analysts calculate AT&T may actually be saving money because it does not have to pay the striking workers. However, AT&T spokeswoman Edith Herman said AT&T is paying managers overtime for strike duty and housing costs for those sent to man locations away from home.

Despite the CWA's claims of degraded service, AT&T maintains that operations are flowing smoothly. "We have 50,000 managers working long hours in sales, installation and maintenance, and we haven't faced any major problems so far," Herman said.

Approximately 96% of the AT&T network is automated. The remaining 4% of the network requires operator assistance.

The biggest contract stumbling block is cost-of-living adjustments, which AT&T wants to do away with in exchange for the higher salaries desired by the CWA. The CWA calls this a give-back that it is not willing to accept. AT&T says its job security package is "very attractive and one of the most innovative in the industry. We've given the CWA a package that is very reasonable in light of what's happening in the telecommunications industry," Herman said.

The CWA claims the offer is insufficient, considering AT&T's profitability.

Washington Update

■ The Senate Commerce Committee last week unanimously approved the nomination of Patricia Diaz-Dennis for the post of commissioner on the Federal Communications Commission. The nomination is expected to go before the full Senate next week.

■ President Reagan recently nominated Mark S. Fowler to serve another term as chairman of the Federal Communications Commission. Reagan has forwarded the nomination to the Senate for confirmation.

If confirmed, Fowler will serve a four-year term. Under terms of recently enacted legislation, the terms of commissioners will be reduced to five years from the current seven.

The president recently signed the so-called terms legislation into law. Fowler has been FCC chairman since 1981.

■ Fedex International Transmission Corp., a subsidiary of Federal Express Corp., is hoping to expand its international service offerings beyond electronic document delivery, according to an application filed recently with the FCC.

Fedex has asked federal regulators for permission to establish additional channels of communication with the International Telecommunications Satellite Organization in order to provide digital voice, high-speed data transfer, facsimile, video teleconferencing and television transmission through Intelsat Business Services (IBS). Fedex hopes to offer the full array of IBS options using its existing network of international earth stations.

Fedex currently communicates with Intelsat satellites in the Pacific Ocean and Atlantic Ocean regions for international document transmission as part of its Zapmail service.

Fedex has invested heavily in its electronic transmission technology and has sustained serious losses on its Zapmail international electronic document delivery service. Analysts estimate the loss to be around $10 million. In order to turn that trend around and maximize the use of its communications network, Fedex is hoping to add to its service offerings and increase network usage, according to observers.

■ Just one week after the FCC gave its approval to the deal, General Electric Co. last week finalized its $6.4-billion acquisition of RCA Corp. The merger took place six months after acquisition plans were put in motion. GE will divest itself of five radio stations as part of the FCC's stipulations for merger. GE also will sell its division that manufactures electron tubes used in closed-circuit cameras and military tracking systems to meet U.S. Department of Justice conditions for the deal.

Analysts expect the consolidation of the two firms to be a lengthy process requiring the sale of parts of RCA and the layoff of some of the company's 87,000 workers. Because there is little overlap in the firms' communications businesses, no disruption is expected there.

— Karyl Scott

Harris/Siemens from **page 1**

systems product lines. Both companies compete in the converging information processing and transport markets with top-tier suppliers like AT&T, IBM and the regional Bell operating companies.

This far into divestiture and deregulation, market forces seem to dictate that second-tier suppliers must position themselves in users' minds as a single-source supplier. "The big fight the second-tier companies have to win is getting people to pay attention to them. They have just begun to do that," said Dan Rosenbaum, a former AT&T executive who now publishes *Wiretap*, an industry intelligence newsletter. As part of that process, both Siemens AG and Harris have been reshaping their organizations to compete more effectively in a market whose boundaries are as volatile as the most recent AT&T reorganization or IBM acquisition.

"What's hard is getting all the necessary skills, product lines and systems together in order to serve that market," said Guy Neumann, senior vice-president of Harris' communications sector. Neumann was named to head the Business Communications Systems Division (BCSD) the company created two weeks ago.

Currently, both Harris and SIS are focusing on setting single sales forces in place. Both companies already have put together broad product lines through combinations of joint ventures, product alliances, acquisitions and their own manufacturing operations. And Siemens AG, unlike Harris, has a presence in the European computer markets it could bring to bear in this country.

At ICA, Harris announced the establishment of BCSD, a new business unit within the communications sector, one of its four business sectors. BCSD is basically the combination of two former divisions within Harris's communications sector, according to Neumann. Specifically, BCSD will target large users such as financial services institutions whose businesses depend on "nonstop, reliable communications," Neumann said.

Through the same sales force that sells across Harris' product line, BCSD will market Pactnet very small aperture satellite terminals and networks, Sophonet packet-switched networks, PBXs and network switches and microwave and lightwave equipment. Pactnet is an AT&T product and Sophonet is a product of Philips AV.

"Our intent is not just to look like IBM and AT&T," said Neumann, "We really want to appear as an alternative to IBM and AT&T to the user. We're going to supply anything from products to product subsystems to complete communications systems for businesses and government."

No second-tier company "can do it all these days," Neumann said, "so there tends to be a lot of these product alliances. You go with your strengths. Instead of going after 100% of the market, you go for 60%."

SIS, which also chose to make its reorganization public at ICA, has taken further steps to position its former PBX and customer equipment marketing unit as a contender in the information systems and office automation markets. Siemens' announcement affected only its SIS unit, and not its sister subsidiary, Siemens Communications Systems (SCS), which focuses on sales to telephone companies.

The gist of its ICA announcement was the addition of two new business areas to the SIS subsidiary, a unit formed about a year ago from the unregulated business of SCS, and the naming of the Communications Systems Networking Group (CSNG). "Basically, we are preparing ourselves for the age of ISDN," said Dietrich Arbenz, vice-president of SIS, "and for the growing importance of the systems side of our business."

Arbenz said the company has "defined two new functions," with the establishment of CSNG, which are "basically in the area of fiber-optic networking and data transmission." He said these functions were "areas where SIS is not doing business today." He said the company would enter these businesses "in two ways, by acquiring expertise, and incorporating the expertise we have access to through our parent company." Siemens AG sells mainframe and minicomputers throughout Europe through various product alliances.

"We are not yet close to a product announcement," said Arbenz, "but we know where we want to go, and that is basically data transmission and fiber networking."

PC nets from **page 1**

seen costs to the implementation. While such soft costs may be difficult for users to calculate, they are very real costs nonetheless.

"The biggest costs, which people don't realize, are time and training," said John Brawley, network analyst in the Network Architecture Group at Boeing Computer Services, Co. in Seattle, Wash. Even if micro users are savvy, they need to learn new commands for navigating the network, Brawley said. To simplify this training, Boeing is developing, at its own expense, a menu system to shield users from the network.

Currently, Boeing has 18,000 networked workstations, Brawley said. But only 2% of the company's 10,000 micro users are networked now. Boeing has a project underway to connect up to 50% of its personal computer users over the next two to three years.

Boeing is looking to networks to provide users with integrated information services. Ideally, the computer services group would like to charge for network use as they would for any other service, Brawley said.

With this approach, cabling, network management and control equipment and other "static" costs — such as development of a user interface — would be spread across the entire population of network users, Brawley said.

In a widespread networking effort, Security Pacific Computer Solutions, Inc. last fall began installing local-area networks in 41 Security Pacific Bank sites, including 39 business centers throughout California. Novell, Inc.'s S-Net and Netware/Arcnet networks were installed, requiring both twisted-pair and coaxial cabling, according to Randy Eliassen, vice-president of Delivery Systems within the California Banking System of Security Pacific. Cabling costs ran from $100 to $300 per connected device.

Eliassen estimates that hardware costs for a small network with an average of eight nodes ran $13,000; a medium-sized network with nine to 15 nodes cost between $16,000 and $18,000; and a large network with 16 to 24 nodes fell in the $20,000 to $21,000 range. Some 500 users received four hours of introductory local net training, while 160 people were given eight hours of training in network administration and security, Eliassen said.

Bringing up these 41 networks, training and two weeks of follow-up work has kept two of his staff people busy for six months, said Jim Smith, president of Security Pacific Computer Solutions, Inc., based in Irvine, Calif. Although he declined to cite a cost for their time, he said the staff members charged a substantial hourly rate.

"Just figuring out what the costs were drove me nuts," Eliassen said. Now that his group is moving into the maintenance phase, he is in the process of putting together a report that will detail all the costs involved in implementing the nets. Some costs are hard to pin down because "a lot of them are buried in bureaucracy. I don't always get charged for corporate resources — they're soft costs," Eliassen said.

Costs that can get buried include personnel time spent in needs assessment and analysis for selecting and configuring the network, Smith said. He also points to a special cost that few companies consider. Companies installing corporatewide networks must draft procedures governing the electronic filing of documents, particularly documents with sensitive information, Smith said. That can be a time-consuming, expensive process.

Needs assessment should include a review of the costs involved in getting rid of existing equipment, according to Rick Stuckey, a partner with Arthur Andersen & Co.'s Technical Services Organization, at the company's Chicago world headquarters. "Equipment displacement costs are the first consideration," Stuckey said.

Installation costs can vary widely, depending upon local building codes, the size of the installation and the type of network selected, he added.

Few companies can provide hard dollar figures for the costs that go beyond straight hardware and software interfaces. For example, how much does it cost to provide a gateway to a remote mainframe? Eliassen investigated the possibility of tying Security Pacific's business centers to a corporate mainframe as a way to move documents from one center to another. Currently, users send diskettes to each other through interoffice mail, and time-sensitive documents are sent by Federal Express Corp.'s Zapmail.

In the two-year period during which he's asked for estimates for gateways for all 41 networks, Eliassen has seen estimates ranging from $60,000 to $1 million annually. "The $1 million really shocked us. It priced our gateway idea right out of the market," he said. While one low estimate covered line charges only, a higher figure of $250,000 more realistically included long-distance and local telephone charges, modems, software and use of Security Pacific's internal communications network. Even at $250,000, Eliassen said he was having difficulty justifying the gateways.

▶ NETWORK CHOICES

Managers fear local net nightmare

Hidden costs and choice of equipment befuddle, hamper prospective users.

BY MARGIE SEMILOF
Senior Writer

No communications manager wants to suffer a networking catastrophe. But choosing the wrong local-area network is a sure way to bring about just such a predicament.

The fear of choosing the wrong product and worry over hidden networking costs (see "Hidden expenses hike local net costs," page 1) are among the reasons some potential buyers are avoiding local net purchases. Also, the disappointing

> *"National Gypsum's networking fiasco cost the MIS director his job."*

experiences of other local net users have left some prospective net customers leery of the technology.

Dallas-based National Gypsum Co. suffered through a 16-month nightmare when one of its divisions installed a local network to link personal computers used for word processing. According to one communications staffer who declined to be identified, the root of National Gypsum's ill-fated networking adventure was simply choosing the wrong product and vendor.

"Depending on the use of the network, any power surge could bring it down," he said. "Our users also hated the network software. Overall, we wasted time and an incredible amount of money — $60,000 — on the system."

National Gypsum's networking fiasco cost the MIS director who was unlucky enough to have made the purchasing decision his job. But despite the bad experience, the company has not soured on local network technology.

"Next time, we will be sure to make the correct choice," the unidentified staffer said. "We needed a network with more power. Another mistake was going with the services of a small vendor. We had to rely on the MIS manager's consulting expertise because we had no maintenance agreement with the vendor."

Of course, not all users have such unfortunate experiences with their networks. But the specter of such problems can send potential local-area network customers scurrying back to study their specifications.

John Meickle, manager of telecommunications planning at Yale University, said managers should consider hiring a qualified consultant when shopping for a local-area network.

"You really must invest time, talent and energy into the purchase of a local network," he said. "Your users and service department should also get some hands-on experience with network maintenance."

When choosing a local-area network, Meickle suggests users avoid concentrating on the product's media: fiber optics, coaxial cable or twisted pair. Meickle added that users should be more concerned about whether the network will be compatible with other communications networking products.

Managers with local-area networks also advise prospective users to consider so-called hidden expenses that will crop up — such as additional wiring costs — during the network installation. They also recommend that users make sure the network has adequate power to handle growth.

Many users who include local networks in their long-range strategic plans learn from the unhappy experiences of other companies. But instead of backing away from the technology, the users adopt a cautious approach. For example, they often test local networks in abbreviated pilot programs before

> *"But the company has not soured on local network technology."*

placing them throughout their companies.

Ron Kreuzer, telecommunications manager at Nestle Co., Inc., said his company does not have a local network in its present facility. However, he intends to install a pilot local-area network in the company's information systems division next year. He hopes the project will help decide whether the chosen network is a good match for Nestle users.

"There has to be some return on the product," he said. "We do not want to give users a local network we feel we cannot administer correctly. That is why we are installing it on a small scale."

Q&A from **page 1**

man pounded home IBM's support for industry standards. Network World *senior writer Paul Korzeniowski interviewed Holleman following his address.*

In your speech, you said that political issues were hindering work on international standards. Would you elaborate on that?
The European Community establishes policies for procurement procedures. If a manufacturer wishes to sell telecommunications equipment in Europe, the equipment must conform to those policies. A number of European manufacturers take part in the policy-setting activity, and some try to protect their own interests through it. Occasionally, situations arise where European manufacturers make it difficult for U.S. companies to market products in Europe by establishing a certain standard. Sometimes, acceptance of a standard involves more than its technical merit.

Will IBM use gateways or native approaches to link Systems Network Architecture and Open Systems Interconnect networks?
IBM will use a combination of the two approaches. Some implementations will appear to be gateways; others will more closely resemble direct or native support. The quickest way to get something out there is through a gateway. The native approach will be more evolutionary. When a manufacturer decides to incorporate OSI in a native way, a lot more time is required to provide that functionality compared with simply adding it to something the manufacturer already has.

Do you see IBM standards such as Document Interchange Architecture in competition with OSI standards such as X.400?
No. DIA and X.400 are not exact equivalents. They represent overlapping circles with many common functions. There are DIA features that are not found in X.400 and vice versa. To provide these functions, changes have to be made. We plan to use the best functions and capabilities that both supply. I think that both will evolve so that the two circles will more closely overlap.

What prompted IBM to publish its network management standards recently?
We feel that we gain more of a competitive advantage by publishing this material. Publishing facilitates attachment of other vendors' products to our networks and aids development of programs that can be used within our architecture. This approach represent a change in our thinking. We will continue to publish some of our documents.

Why did you choose to publish the documents rather than work with a standards committee, such as the International Standards Organization, to develop network management standards?
It wasn't an either-or choice; we would like to do both. We have tried to work with standards committees. When OSI work first began, we offered SNA documentation as a working example of a network model. The committee chose not to incorporate that material directly. Last year, we offered LU 6.2 to the European Computer Manufacturers Association at its request. Unfortunately, it chose not to use that IBM approach. We are willing to offer items to standards organizations, but sometimes there is a reluctance to accept our work because it came from IBM.

Were you surprised that Ecma turned down LU 6.2?
The committee said it did not want to develop a standard for transaction processing from scratch, so we offered LU 6.2. On the way to market, politics got in the way, and other manufacturers felt a nonproprietary approach should be developed. We were disappointed that the work was not incorporated.

> *"ISDN is as important to a transportation network as OSI is to information processing."*

Has the company offered its network management specifications to OSI?
Not at this point. Network management is just starting to be discussed in the OSI model. As the topic develops, we may offer our documentation to the group, but we have not made a decision either way on that matter.

What is IBM's view of Integrated Services Digital Networks?
ISDN is as important to a transportation network as OSI is to the information processing part of a network. Our interest involves attachment standards and protocols, because that's where our equipment would hook into ISDN. That attachment could be through a communications controller or at a private branch exchange. There are two questions concerning ISDN. Will current standards actually be implemented? There have been significant changes to ISDN standards since 1984. Second, will users be the recipients of the lower cost that should come with the new services, or will those reduced costs disappear as ISDN works its way down the line?

What sort of time frame do you see for ISDN implementation?
A longer time than needed for OSI. General product availability has to be somewhere into the 1990s, but it is difficult to say exactly when. The 1990s are the time most frequently discussed.

INDUSTRY UPDATE

A billion saved, a billion earned

Asked about Senate Majority Leader Robert Dole's (R-Kan.) proposal to shift oversight of AT&T's divestiture away from U.S. District Court Judge Harold Greene, John Guttenberg, North American Telecommunications Association (Nata) spokesman, said he read a statement by Yankee Group President Howard Anderson that said U.S. District Court Judge Harold Greene's oversight of divestiture probably saved the regional Bell operating companies $5 billion in dumb acquisitions.

Said Guttenberg: "In one sense, I think that's true. Nata for some time has commented on its concern that the RBOCs had lost at least $1 billion through their competitive subsidiaries. I guess it could have been a lot worse."

▶ DIVESTITURE

Bill poses FCC control

Move to block Judge Greene may signal power shift.

BY SHARON SCULLY
Senior Editor

WASHINGTON, D.C. — The unexpected appearance of a bill that would shift oversight of the AT&T divestiture away from U.S. District Court Judge Harold Greene to the Federal Communications Commission could signal a broad shift in governmental control and regulation of the telecommunications industry.

Authored by Senate Majority Leader Robert Dole (R-Kan.), the bill was recently circulated in draft form to the regional Bell operating companies and others. It generally drew a wait-and-see response from the RBOCs, its primary beneficiaries. Nonetheless, the alignment of FCC Chairman Mark Fowler and Dole against Greene introduced a significant change in the current regulatory climate here.

Officials at RBOCs said, for the most part, they would welcome any move to cut down the federal oversight on their new business activities. But they also expressed skepticism with regard to the draft bill's prospects.

Reportedly backed by the Reagan administration, the Dole proposal was said by some industry observers to be little more than political turf maneuvering. The proposal was also said to be a testing of the waters by Dole, the vice-presidential candidate on Gerald Ford's losing Republican ticket in 1976, who is reportedly assembling his campaign committee for the upcoming presidential election. Dole, who has not espoused such industry legislation in the past, may be trying to gauge his support within Congress.

The proposal served to spotlight what could become a broad power shift here in the regulation and control of the huge telecommunications and information systems industries. As one source inside an RBOC said, "It's very interesting that Mark Fowler and Bert Halprin both came out and made negative statements against Greene. Any time Greene has been held up to public scrutiny, negative comment has been at most innocuous. Until now, no one's been willing to take him on."

In a related development, the Reagan administration last week officially renominated Fowler for FCC chairman. The move had been expected for at least two weeks, although the chairman himself had noted on several occasions over the past year his interest in securing private sector employment.

Fowler's chairmanship over the next four years, if approved by the Senate, could significantly alter the climate of regulatory policy here if Dole's proposal elicits strong support in Congress. In supporting the Dole legislation and the Fowler chairmanship, the Reagan administration is clearly signaling a policy of wholesale deregulation of the telecommunications industry.

Other recent events that indicate a radical shifting of the powers controlling the industry include the

See **Dole** page 10

VENDOR VIEW

MARK DAVIES

The high price and promise of ISDN

The Integrated Services Digital Network has been proposed as the miracle cure for communications ills in the 1990s. Touted as a transparent pipe over which any kind of communication is possible, ISDN holds the promise of a vast array of new services for consumers — from on-line directories and Yellow Pages to teleservices such as electronic shopping and teleconferencing.

ISDN has been called the solution to the magnitude of problems created by today's complex networks and business requirements. It is no wonder that users are attracted to ISDN. Made possible by combining digital communications and a separate signaling path, ISDN is a concept that will provide users with great flexibility. It will provide end-to-end networking. It will handle voice, data and video. Real-time usage will dictate bandwidth allocation. And users' wide-area networks, both public and private, can be reconfigured by the users themselves.

Promises notwithstanding, the basic question surrounding the ISDN concept is what part will become reality and what part is pure blue sky. Certainly ISDN is technologically feasible. However, it is not clear that all of enhanced ISDN services will see the light of day any time in the near future.

This uncertainty is borne out by a look at the evolution of ISDN. Specifically, ISDN is a carrier-invented solution, and as such, it addresses the carrier's installed plant problem. Telephone companies and long-distance carriers need to upgrade their facilities in order to reduce operating costs. An integrated network allows them to do this. At the same time, they must maintain their profitability and growth. To ensure a stronger tariff base, they must provide added value to users through enhanced services; hence, ISDN.

ISDN will reduce carriers' operating costs, since their largest cost is labor. Through the out-of-band signaling channel, carriers will have a secondary channel to automate and manage their networks. Every device on the network will be controllable, and central diagnosis will be possible. Rather than having to respond to network outages by sending service technicians to the sites, carriers will be able to diagnose the problems from a central point, and in many cases, repair them from the same place. Digital transmission will improve the quality of transmission, as it reproduces voice cleanly.

But for the efficiencies ISDN will afford them, carriers will have to pay the price to over-

See **ISDN** page 10

Davies is vice-president of wide-area networking products for Codex Corp., Mansfield, Mass.

▶ ROLM CORP.

PBX maker realigned

May hasten product merge with IBM.

BY SHARON SCULLY
Senior Editor

SANTA CLARA, Calif. — Rolm Corp. has realigned its communications equipment manufacturing divisions in a move some industry observers said could be intended to hasten the integration of the private branch exchange manufacturer's product line with that of its parent, IBM.

Several product development and manufacturing divisions were combined, and new strategic planning and engineering units were formed.

The move closely follows Rolm's recent formation of a new office of the president held equally by Dennis Paboojian, president, and Robert Maxfield, Rolm co-founder and executive vice-president.

The reorganization also comes on the heels of the company's replacement of its long-time marketing vice-president, Richard Moley, with two vice-presidents, George Harvey, former president of Rolm Canada, and Richard Zalisk, former general manager of the Messaging Products Division.

Rolm combined its Networks Products Division, Large Communications Systems Division and Communications Systems Division into a new CBX Systems Division. The Network Products Division manufactures networking and interconnection products; the Large Communications Systems Division makes large PBXs; and the Communications Systems Division produces medium-sized PBXs.

The CBX Systems Division will be headquartered here and headed by Bill McDonnal, former general manager of the Large Communications Systems Division.

The company also combined its Rolmphone Division and Desktop Products Division in Austin, Texas, into a new Telephone Products Division, which also will become part of the Systems Development Group. This group, which will report to Rolm's new office of the president, will be headed by vice-president John Mitcham. The new Telephone Products Division will be headed by Doug Stone, former general manager of the Desktop Division. Digital telephones are made by the Rolmphone Division. Terminals,

See **Rolm** page 10

ISDN from **page 9**
haul much of their presently installed plant. In today's competitive telecommunications environment, carriers are hoping to pay as they go, amortizing the investment in new plant with new, pre-ISDN services.

But while network management capabilities and better transmission facilities improve basic service to users, they are not actually ISDN-enhanced services.

What new services will ISDN make possible? Through its digital channels, ISDN supports simultaneous access to multiple services because more than one kind of transmission can take place at the same time. As an example, data can be transmitted while a phone conversation is taking place. Or two voice conversations can be supported by the same line, giving users the ability to configure their own conference calls. The possibilities for services based on this technology are vast.

In the voice arena, call waiting and call screening services are viable. New data-oriented services that users will most likely see are on-line phone directories and Yellow Pages. Information routing services such as home banking will also be made more commonplace. Combining voice and data capabilities will increase services such as credit card validation and reservations systems.

Extrapolating ISDN's future even further, imagine a world in which touch-screen display phones are in every home, electronic mail is a household word and consumer teleservices such as electronic shopping are the normal mode for conducting personal business.

But users and vendors must address reality. The industry is rapidly gearing up to support implementation of ISDN transmission services. Some Consultative Committee on International Telephony and Telegraphy standards already have been established and are being adapted for the competitive environment in the U.S. as well as for the government controlled monopolies of Europe. Although the ISDN model does not fit cleanly with the Open Systems Interconnect model supported by the International Standards Organization, there is an industry push toward the coexistence of these standards. This has been made even stronger by the Federal Communications Commission's recent requirement that carriers support open network architectures prior to offering enhanced services.

Some digital services, such as end-to-end circuit and packet switching, are being implemented in today's networks. In addition, trials of ISDN transmission services will begin in late 1986 and continue through 1988. These include services for custom signaling, network management and reconfiguration, simultaneous voice and data and digital switching.

The service applications themselves remain in the realm of ISDN fantasy. While services such as home banking are feasible, few teleservices have been proven in the market. Some exceptions include dating services and on-line medical health services in France and shopping services in Japan, where public shopping is associated with considerable social pressures.

Whether these consumer services become available in the near future depends on more than their individual market viabilities. Primarily, it is a problem of cost. There is a tremendous expense involved in replacing the massive installed plant of the telephone companies. It will take a long time to turn over the installed base, since on a consumer level, all carriers must convert in order to make ISDN applications widely available. Home applications, then, will be the last to market.

Instead, private corporations will probably move to ISDN long before the general public is offered access to ISDN services. This is due to the fact that carriers will build their ISDNs by first utilizing T-1 lines that are already in place and represent a relatively small installed base. AT&T has said it will begin offering primary rate, T-1 access to its network in 1987. Several regional Bell operating companies have already announced a similar expected date for implementing primary access. As a result of these announcements, it is expected that the first ISDN-like services will be offered in early 1987.

While the conversion to ISDN represents a major cash outlay for the old carriers, it is a smart business decision for companies installing new private carrier systems in the late 1980s. Although the evolution of new services is expected to be gradual, it is certain that ISDN will be the ultimate interface into public networks.

Even though services may never reach the level that futurists today describe, ISDN will give users a chance to build their own private ISDNs by tying directly to the carriers' ISDNs. Intelligent customer premises equipment will be the link in allowing businesses to build these efficiently managed networks. Large users will use T-1 lines and nodal processors combining both packet- and circuit-switching capabilities.

Dole from **page 9**
recent Supreme Court decision to uphold the states' authority in determining telephone company depreciation schedules, and the unveiling of the FCC's Third Computer Inquiry, the most liberal of the three inquiry rulings ("FCC hands down new industry rules," *Network World*, May 19).

In response to the FCC's Computer III ruling, the Department of Justice, which assists Greene in supervising divestiture, and the National Telecommunications and Information Administration appealed for moderation in the relaxation of the structural separation rules. Both agencies filed documents warning the FCC that such easing could allow the BOCs to exploit their control over the local exchange network and unduly influence competition in equipment markets.

Last Monday, on the day Dole was expected to officially propose the bill, an article in *The Wall Street Journal* reported a so-called rebellion against Greene's rule over the industry. In the article, Fowler was quoted calling the FCC the "expert agency," which should decide telecommunications issues instead of "a single judge with a very small staff and without telecommunications expertise."

In the same article, the FCC's Common Carrier Bureau Chief Bert Halprin was quoted as saying that Greene "doesn't have the ability to make these judgments." Halprin said that his agency has a "staff of 330, and [Greene] has only a couple of clerks," in reference to the Justice Department's antitrust task force staff.

Following publication of the article, Dole canceled a Monday press conference to announce proposal of the bill. Sources inside the Justice Department were unusually adamant in refusing to comment on *The Wall Street Journal* report or the bill.

While Justice would issue only a "no comment," an industry expert said the circulating draft of the Dole bill could be "just a trial balloon. Dole's a pretty careful person, and he probably wants to flush everybody out of the woodwork before he goes out on a limb."

However, Dole apparently neglected to flush out Commerce Committee Chairman John C. Danforth (R-Mo.), who was unaware of the bill two weeks ago when he asked the Senate for comment on what type of legislation would best move the RBOCs into new businesses.

Bell Atlantic Corp. officials said they welcomed the "initiative and the fact that Congress is reasserting itself as the policymaker. Making the FCC the appropriate federal agency for implementing national telecommunications policy is a good thing for us."

Representatives of US West, Inc. in Englewood, Colo., said the proposed bill supported what "we have said all along — that Congress and the FCC should determine broad telecommunications policy.

"If this legislation is passed, we hope the commission will continue its policy of relaxing such constraints as the Modified Final Judgment." The RBOC, known for its aggressive opposition to federal judicial oversight, last month filed in appeals court its own proposal to remove Greene of his oversight power.

According to Richard Adler, an attorney here for New York-based Nynex Corp., the company has not "actively endorsed the legislative route," but that it welcomes public policy debate on the issue.

Rolm from **page 9**
integrated voice/data devices and personal computer communications products are made by the Desktop Division.

The company also formed two horizontal divisions within the Systems Development Group to provide services to the new divisions. Development Operations will provide engineering and computing services, while Strategic Planning will concentrate on developing interfaces between the Rolm and IBM product lines, as well as overseeing long-term product planning.

Richard Moley, who left the company last week, was Rolm's marketing vice-president since 1973 and head of international activities since 1984. He reportedly left the company to join a start-up company, StrataCom, Inc. in Cupertino, Calif.

The new structure is also intended to ease the management burden on Paboojian, who, prior to creation of the two-man office of the president, had 11 top executives reporting directly to him.

Save 10% to 30% Of Your Network Costs!

Today, many companies can save thousands by simply selecting a different billing arrangement for their telecommunications services. Two things are needed.... First, managers need a way to compare tariff possibilities, and second, they need the detailed circuit specifications so that the revised services can be ordered with accuracy and confidence. All of this is available *NOW* with OTIS™.

Online™ Telecommunications Information Services

OTIS™ is a dial-in subscription service that provides detailed information about all aspects of telecommunications; including pricing comparisons of leased line and dial calls through *EASYPRICER*™, LATA carrier information and competitive tariffs offerings. Virtually every long distance and local exchange carrier is supported! Call or write Now!

Connections

Please send FREE information on the following:

OTIS ☐ MNDS ☐ Consulting ☐

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Phone ( ) _____

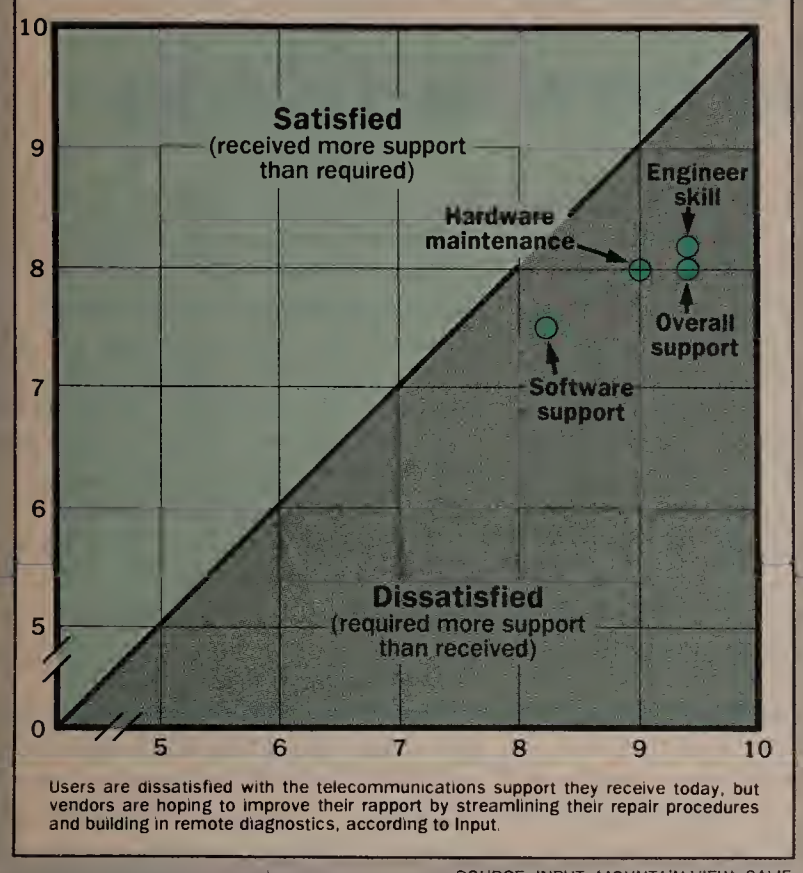
Connections Telecommunications, Inc.
322 East Center Street
West Bridgewater, MA 02379
(617) 584-8885

TELECOM TRENDS

British Telecom nabs TAT-8 accounts

British Telecommunications PLC landed several major customer accounts for its portion of the TAT-8 trans-Atlantic undersea cable three days after announcing a price schedule for the cable. The commitments, representing more than $4 million, came from Mobil Corp., Barclays Bank Ltd., British Airways, Management Science America, Inc. and other companies. TAT-8 is supposed to be operational two years from now.

User satisfaction with telecommunications support



Users are dissatisfied with the telecommunications support they receive today, but vendors are hoping to improve their rapport by streamlining their repair procedures and building in remote diagnostics, according to Input.

SOURCE: INPUT, MOUNTAIN VIEW, CALIF.

SATELLITE SERVICES

RCA Americom fights back

Company's future pinned on Microstar.

BY JOHN DIX
Senior Editor

PRINCETON, N.J. — While longtime satellite industry stalwart RCA American Communications Co. (RCA Americom) has had to play catch-up of late with a few market upstarts, the company is fighting back with a recently revamped product line that includes the company's first small dish antenna satellite service.

Although point-to-point 56K bit/sec satellite links remain RCA Americom's bread-and-butter service, the company is pinning its future on a new family of services called Microstar, according to David Friedman, director of business networks and systems marketing.

Microstar Networking Services — RCA's entry into the very small aperture terminal networking market — is the most strategic of the new Microstar services, Friedman said. Other digital services in RCA's portfolio include Microstar 56 KBPS, Microstar T1, Microstar Video Conferencing, Microstar C-Band International Business Satellite Service and Microstar Ku-Band International Service.

Microstar Networking Service is RCA's answer to the host of Vsat carriers that have popped up overnight and now threaten the company's mainstream business. RCA's Vsat competitors include early-bird Equatorial Communications Co. and a growing list of newcomers, including Com-

See **RCA** page 12

CONTEL

PC analysis tool out

BY MICHAEL FAHEY
Staff Writer

Contel Business Networks recently announced a personal computer version of its Mind-Data network analysis tool. The product is the latest in the company's line of network optimizing and analysis tools.

The Mind-Data/PC runs on an IBM Personal Computer XT, Personal Computer AT or compatible and requires 512K bytes of memory and a 10M-byte hard disk drive. The system is a tool designed to help communications managers price, manage and optimize data communications networks.

Once the user has built a replica of his network into the system's memory, the software makes it possible to do response-time analysis, network topology design and network optimization using cost and performance as trade-offs.

The response-time analysis feature of Mind-Data/PC enables customers to gauge how use of IBM's efficient Synchronous Data Link Control protocol will affect network performance compared with IBM's older Binary Synchronous Communications protocol.

See **Contel** page 12

CROSS TALK
JOHN DIX

Centrex users register complaints, suggestions at ICA conference

Phantom system changes, disappointment with the Centrex III, management tips and cost saving pointers were topics of discussion between Centrex users gathered at the recent International Communications Association conference in Atlanta.

The roughly 35 attendees of the show's Centrex Users session let out a collective groan when the topic of class of service and Centrex III came up. Many of the users said their Centrex systems were making arbitrary parameter changes that were a nuisance at best and costly at worst.

Mysterious class of service reclassifications have resulted, for example, in the removal of toll restrictions, which enabled unauthorized users to place long-distance calls. Local telephone companies do not acknowledge the incidents as a problem, though they may be forced to pick up the resultant tabs.

Centrex III users are plagued by these and other aberrations. Customers of the Centrex III — the latest and most advanced type of Centrex offering with features that rival those of private branch exchanges — complained of call dropping and loss of console support. One user said his system forwards calls randomly, leaving unsuspecting users wondering about their sudden loss of popularity.

A large customer in Montreal said he wouldn't pick Centrex III if he had to do it all over again.

Complaints aside, the user group exchanged ideas about how to manage their systems better. Many customers reported satisfaction with products that make it possible to generate daily usage reports, instead of waiting for the typical monthly report delivered on magnetic tape.

Equipment from NEC America, Inc. and Telco Research Corp. reportedly enable users to tap a central office switch via a private line to create daily facility management reports. This can turn up faulty lines and other problems in a timely fashion.

While such a service is desirable, many users said prices rangé from an acceptable $400 a month to an unacceptable $2,000 a month. Some users said they had been successful convincing their local telephone companies to lower their rates, and the group was urged to use others' experiences to put pressure on their service vendors.

Another area where customer pressure has swayed a local telephone company decision is in late payments. A user with the state of Pennsylvania said the bureaucratic process routinely resulted in Centrex payment delays. After Pennsylvania Bell established a late payment charge, the state worked out a special payment deal that saved $600,000. The attendees agreed that most of the former Bell operating companies will work out contract pricing to make their services attractive.

Only a few of the Centrex customers raised their hands when asked who was using Centrex to support data devices. One user said he is using the

See **Centrex III** page 12

▶ NORTHERN TELECOM

Videoconference system bows

MS-1 enables 24 people to partake in one conference call.

BY NADINE WANDZILAK
Staff Writer

NASHVILLE — Northern Telecom, Inc. has announced a voice conferencing system that enables 24 people to participate in a telephone conference call from as many locations using any telephone.

The Meridian Meeting Communications System (MS-1) is a digital voice conferencing system designed to work with most manufacturers' private branch exchanges, or as a teleconferencing bridge in association with a telephone company's Centrex service.

Conference resembles face-to-face meeting

The MS-1 allows two persons to speak simultaneously and a third to interrupt the conversation, similar to a face-to-face meeting. Each person joining the meeting hears the entire conversation. The typical clicks, echoes and clipped words of voice conferencing are reportedly eliminated.

A new speaker can be included in a conversation within four to 12 milliseconds. During a conference, the meeting leader can take a roll call and add or delete participants using a push-button telephone. A Meridian M4020 integrated voice/data terminal is used to control the system's operation and administration.

Future upgrades will include support for data conferencing services and audio-graphic conferencing using personal computers as the data conference workstation.

Upgrades will also include the ability to support 48 people and the ability to add a software package to handle meeting reservations and automatically activate and deactivate conference ports.

The price of a Meridian MS-1 system, which is scheduled to be available July 31, is reportedly going to be $47,995.

Northern Telecom, Inc., 200 Athens Way, Nashville, Tenn. 37228 (615) 734-4576.

▶ CENTRAL OFFICE LANS

Bell Atlantic unveils new services

BY JOHN DIX
Senior Editor

Bell Atlantic Corp., the first of the divested Bell companies to offer central office-based local network-like services, announced service enhancements at the recent International Communications Association conference in Atlanta. New features include wide-area networking, network management and additional protocol support.

CO LAN is a Centrex feature that provides data support through Data/Voice Multiplexers (DVM) at the customer's site and at the central office switch. The DVM is a data over voice technology that enables a Centrex voice line to support data at a higher frequency band at speeds up to 19.2K bit/sec.

Wide-area networking will be made possible by interconnecting the individual central office switches used today to provide CO LAN. Bell Atlantic will link central offices within local access and transport areas and use interexchange carriers to connect CO LANs in different Latas within Bell Atlantic's operating company regions. The company said it may eventually take the service nationwide.

The first application, a regional wide-area network for a government agency, is now being installed. It will interconnect four switching centers, roughly 500 ports and 26 locations throughout six states.

Network management for CO LAN will be tested in two pilot projects beginning in July. The system feature will reportedly provide customers with on-site network control and management features, including the ability to manage network changes and generate traffic and billing reports.

Packet Switching/X.25 Protocol, a feature that will enable Bell Atlantic operating companies to link CO LAN to the company's Public Data Network packet-switching service, is scheduled to be tested later this month. Later in the year, Bell Atlantic will test the ability of direct X.25 CO LAN support.

The company said it will also field test support of IBM 3270-type terminals later this summer.

17,000 ports by year end

Since its introduction roughly one year ago, Bell Atlantic has installed 11 CO LAN customers. By the end of the year, the company expects to have 17,000 ports in service and as many on order. Projections for 1988 peg the number on order at 60,000, which the company says is a conservative estimate.

Bell Atlantic operating companies include Bell of Pennsylvania; Diamond State Telephone, which serves Delaware; New Jersey Bell; and the Chesapeake and Potomac Telephone Companies of Washington, D.C., Maryland, Virginia and West Virginia.

RCA from **page 11**

sat Technology Products, AT&T Communications, Inc., GTE Spacenet Corp. and Tymnet/McDonnell Douglas Network Services Co.

Like other Vsat offerings, Microstar Networking Service uses Ku-Band satellites. This enables use of small 1.8-meter earth stations and the ability to install antennas in metropolitan areas without interfering with terrestrial microwave traffic. The service is point-to-multipoint and is intended for use in the distribution of data from a central earth station to multiple remote sites.

Microstar Networking Service is 10% to 40% cheaper than AT&T's analog, terrestrial multidrop line services, depending on the traffic, number of terminals on the system and the length of the contract, Friedman said. Pricing is determined on a contractual basis and may differ owing to the random access protocol used and speeds required.

Microstar 56 KBPS is a new full-duplex, point-to-point digital service that uses 1.8- or 2.4-meter antennas mounted at the customer's premises. Service rates are not sensitive to distance. RCA's older 56 Plus service, which is offered over the company's own major route network, includes local loop fees.

Microstar 56 KBPS uses single-channel per carrier technology and typically supports V.35 interfaces. The service costs from $2,500 to $3,000 per site, including the earth station, space segment and operations and maintenance.

RCA's Microstar T1 service is a full-duplex, point-to-point digital service that requires 3.5-meter or 4.6-meter Ku-Band earth stations. Friedman said the offering is competitively priced with terrestrial T-1 services, but he declined to outline the specifics of the pricing. Microstar Video Conferencing builds on Microstar T1 by including the coder/decoder, monitors, cameras and other equipment needed for full-motion video meetings.

RCA provides its Microstar C- and Ku-band international services through RCA Global Communications, Inc. (Globcom). Globcom provides access to the Intelsat 5 satellite system and to 200 foreign Postal Telephone and Telegraph administrations. Digital services include 64K bit/sec and T-1 offerings. Both C- and Ku-band services are offered because the footprint of the Intelsat Ku-band satellite over the Atlantic cannot serve beyond Illinois; the C-band bird can service the contiguous U.S.

RCA's advantage

Friedman says RCA's advantage over other carriers is that it is a vertically integrated company.

Although its Microstar family requires dedicated earth stations, the company can also create hybrid networks by mixing Microstar systems with its major route network, a private RCA system comprised of large earth stations used to provide shared network services.

Although RCA has been trumped in a game it has ruled for years, Friedman says the company has the design expertise and the all-important support facilities to keep it in the forefront of the competitive satellite wars.

Contel from **page 11**

Other performance data can be studied by using the product to evaluate backbone network alternatives as determined by network node characteristics such as switch capacity. The price of these switches can, in turn, be used in cost evaluations.

Mind-Data/PC supports popular tariffs, which can be used with the other system components to determine the overall cost of various network configurations.

For example, customers can ask hypothetical questions based on existing or planned network requirements. Answers can be given to questions regarding line speeds, location of node sites, tariff economics and volume changes as well as pricing and network responsiveness.

In addition, the Mind-Data/PC can be used to track the addition of or relocation of equipment, to keep tabs on network capacity and traffic balancing, and to help users reconfigure their networks in order to cut costs. The Mind-Data/PC will be available in July for about $5,000.

Centrex III from **page 11**

Centrex wiring to connect terminals to an on-premises data switch.

Although there are devices that can be used in conjunction with Centrex services to provide integrated voice/data services, it was the opinion of one customer that it makes more sense to achieve this capability by installing a private branch exchange, instead of by trying to flesh out Centrex.

A telecommunications manager from a large New York state university said he recently released a PBX request for proposal and told his local telephone company that it would have to improve on the flexibility, cost and control of its Centrex service to remain competitive.

Although the local operating companies have many improvements to make, most of the customers at the session agreed that the local operating companies have come a long way in turning Centrex around. Before divestiture, AT&T had told its local BOCs to raise the price on Centrex to encourage users to migrate to PBXs, a movement that would eventually kill the central office service.

DATA DELIVERY

"Users should always ask a vendor what terms mean. They should not assume that any term has a universal definition. Customers can often be taken in by foggy vendor talk, where a vendor's definition of a term does not resemble the definition that others in the industry use.

Louis A. Cascardo
client education
AT&T Communications, Inc.
Cincinnati, Ohio

▶ TERMINAL EMULATION

Board business booms

"The boards are likely to serve only as an interim solution to users' communications problems. As standards for local-area networks, gateways and IBM's LU 6.2 protocol become better defined and are embodied in available products, stand-alone emulation boards may become an outdated solution."

BY MICHAEL FAHEY
Staff Writer

FRAMINGHAM, Mass. — While sluggish sales have plagued many sectors of the computer industry, the terminal emulation board business is booming, according to a recent study conducted by International Data Corp. (IDC), a market research company headquartered here.

A terminal emulation board is personal computer hardware that provides the proper physical and electrical connection between a mainframe or minicomputer and the personal computer. This hardware, in conjunction with the board's communications software, allows a personal computer to act as a mainframe or minicomputer terminal.

The IDC report notes that in 1985, U.S. shipments of emulation boards totaled 230,000 units, an 84% increase over the number of boards shipped in 1984. Because of IBM's dominance in the computer industry, the terminal emulation market consists almost entirely of products that support IBM equipment. IDC estimates that at the end of 1985, the total U.S. installed base of emulation boards for IBM 3270 and IBM 5250 terminals was 356,000 units.

In 1985 alone, 187,000 3270 terminal emulation boards were shipped, and, according to the report, shipments of these boards should reach 584,000 by 1990. That figure represents a 34% compound annual growth rate. Revenue from 3270 and 5250 emulation board shipments was $238 million in 1985, and IDC expects the value of such shipments to reach $1 billion by 1990.

The terminal emulation market's

See **Boards** page 14

IBM INSIGHTS

How about these numbers, baby? Getting shipment numbers from IBM is about as simple as pulling tusks from an elephant. Consistently, Big Blue has attempted to shroud its shipment numbers from even its largest customers and most-trusted industry consultants. So it was more than a little bit surprising when a press release heralding the shipment of 100,000 System/36 minicomputers found its way to our office.

Not only did the release include the shipment numbers, but it included the name of a happy System/36 user, Continental Insurance Co. in New York, which has installed more than 250 of the minicomputers. Big Blue seems to be responding to critics who have claimed that the System/36 is not selling well. As long as the company is in a disclosing mood, it should also supply the industry with shipment figures for its Token-Ring Network, PC Network and Series/1 minicomputer.

Flexing a Big Blue muscle. *Telecom/Eye*, a newsletter from market research firm International Resource Development, Inc. in Norwalk, Conn., reported that MCI Communications Corp. amended its bylaws at its annual meeting. The changes had been stipulated by IBM when Big Blue purchased 17% of the communications company's stock.

MCI's charter had stipulated that stock owners could exercise only one one-hundredth of a vote for each share greater than 10%. Now they have a full vote for each full share. In return for the change, IBM promised to loan MCI $400 million.

DATA DIALOGUE

GABE KASPEREK

A switch in time . . . The matrix switch approach to net management

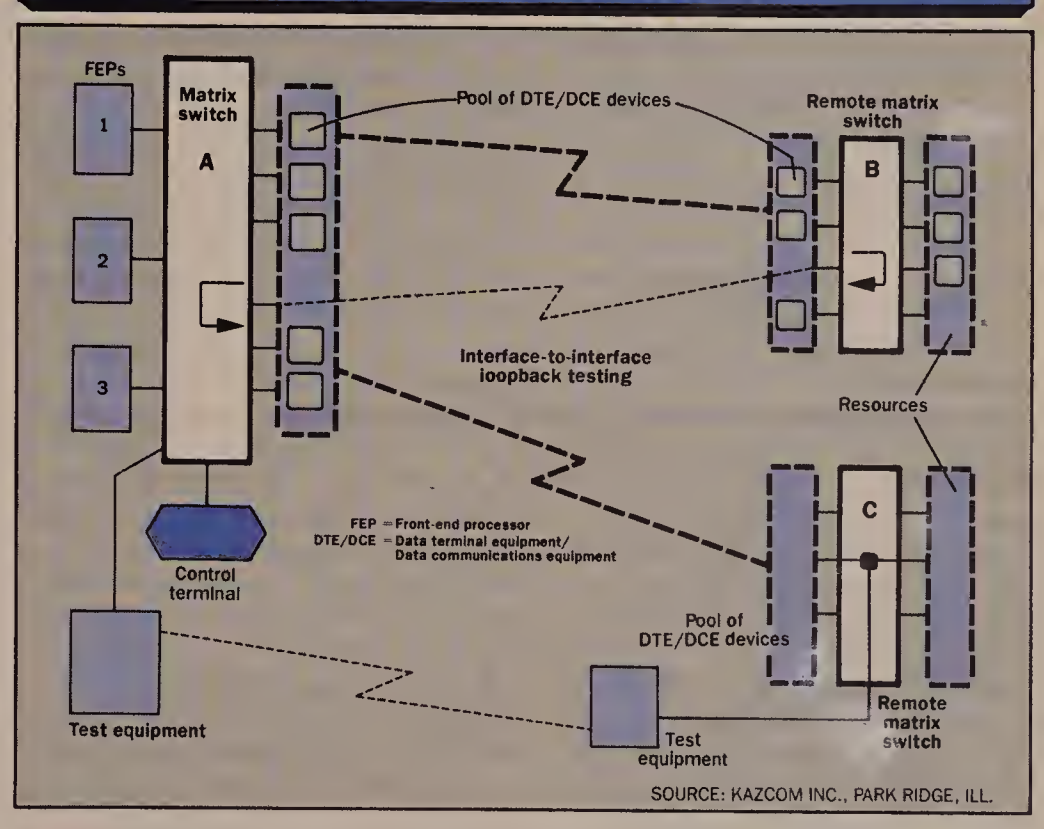
Because most networks contain a variety of vendors' communications and network management equipment, there is a myriad of approaches to controlling a data communications network.

When selecting an appropriate approach, a user must evaluate how well the offering supplies basic network management functions such as line restoration, line monitoring, fault isolation, information management and performance monitoring. This week's column will discuss how well a matrix switch performs these functions.

A principal benefit that a matrix switch supplies is line restoration. Applications typically work with different types of interfaces. A matrix switch typically sits between a front-end processor and the lines connected to it. The device acts as circuit switcher and enables any incoming port to be switched to any outgoing port and vice versa. For example, if a front-end processor ceases to operate, the switch could be used to take the incoming lines and route them to a spare front-end processor. Without a matrix switch, a network operator would be unable to perform this type of function.

Kasperek is president of Kazcom, Inc., a Park Ridge, Ill.-based network management consulting firm.

Matrix switch application



SOURCE: KAZCOM INC., PARK RIDGE, ILL.

The device can be used to restore connections for any type of data terminal equipment and data communications equipment. Typically, a user supplies a spare piece of equipment to ensure that lines stay up and running. If there is a problem, lines can be switched to the spare piece of equipment.

Switching is not only used with complete component failures. Lines could be switched to alleviate performance degradation, to free up additional resources or to improve network response time. The switching action can be commanded by a network operator, or it can be accomplished automatically during specified periods of the day.

A prime use of the switching facility is for the installation of new equipment. A user can switch from an old piece of

See **Control** page 14

▶ INTEGRATING NETWORKS

Users long for links to solve WAN, LAN inconsistencies

The management of two technologies is proving to be difficult for most users.

First of a two-part series.

BY TIMOTHY J. WISE
Special to Network World

While many technologies have matured in a short time, the same cannot be said for networking technology. It has experienced a slow, long evolution.

The newest segment of the networking industry is microcomputer local-area networks. These networks can be viewed as adolescents who have not grown old enough to support sophisticated monitoring, administration and control tools. In addition to lacking proper tools, local-area network gateways are creating administrative problems. Gateways are being used to link local-area networks to wide-area networks, even though these two types of networks differ dramatically.

To stabilize the new environment, local-area networks must evolve to comply with technique systems that have already been established for wide-area networks. To illustrate this maturation, this article will discuss network management tools for two technologies: IBM's Systems Network Architecture and Network Basic I/O System (Netbios).

Many of the problems currently plaguing local-area network users and administrators mirror problems that have been solved for the wide-area network. Techniques are needed to bridge the technologies and to apply administrative tools and products originally developed for backbone networks to local-area networks.

Several years ago, IBM introduced its first set of useful network management tools. These tools provide a network administrator with the information required to monitor a network of systems properly and to control the use of the system services. They also supply capacity-planning features.

Current SNA management tools come in the form of both software and hardware. The hardware tools monitor the quality of the phone lines and the network hardware's error rates. These tools are typically custom-built and adapt off-the-shelf line monitors to a networking environment. Software tools, such as IBM's Network Problem Determination Aid, monitor throughput and network performance.

The microcomputer network presents an entirely different situation. Most local-area networks do not provide any tools for monitoring or managing local-area network resources. A local network typically includes devices that are often reset, thus making collection of error and performance statistics difficult and suspect. The network manager may then be forced to estimate network and file server performance.

A local-area network manager needs a number of tools to gauge network events and network throughput. First, it is important to monitor file server throughput, which differs from network throughput since there may be several file servers on a network. Also, he must monitor disk space allocation to know who is using disk space and for how long.

Few managers attempt local-area network capacity planning. Many believe that since microcomputer equipment is relatively inexpensive, a company can add services to a network at minimal cost. Capacity planning would cost more than the extra equipment.

This belief is only partially true because there are hidden costs when supporting the new service. A file server needs to be backed up. In addition, several issues must be resolved, including which users move to the new server and how files will be dispersed from existing servers to new ones. The administrator also must gauge how access rights will be affected.

The network administrator needs a method to manage the resources on the network for the user and a method to monitor performance for capacity planning for management. It is time for these network management tools to emerge. Many network administrators find that the only way they can get the information they need is to write the tools themselves.

Even though management tools are still being developed for local-area networks and a combined local- and wide-area network approach is not yet available, progress is being made. Network gateways are the first step toward a more unified environment.

Open dialogue between the two worlds could be possible with a well-implemented gateway. Dividing points between the two networks must be seamless to the user, because the user will not be concerned with how the gateway operates. The second part of this series will discuss how these two network approaches are being linked.

Wise is vice-president of research at Pathway Designs, Inc., a Natick, Mass., communications software vendor.

Boards from **page 13**

rapid growth, which the report predicts will last through the end of the decade, is fueled by the increasing demand for multipurpose workstations combining local and host processing capabilities.

Digital Communications Associates, Inc. (DCA), maker of the Irma family of emulation boards, is the leading supplier of terminal emulation boards. DCA recently merged with Forte Communications Co., which produces a similar product. The IDC study forecasts that this move will further strengthen DGA's position in the market. While DCA dominates the market, CXI, Inc. and AST Research, Inc. are also significant players.

Despite its position as the distant second-place competitor to DCA in sales of 3270 emulation products, IBM has not yet chosen to assert itself strongly in the market. IDC predicts, however, that IBM may take a more active role in the terminal emulation board market.

Contrary to the strong prospect for growth in the terminal emulation market, the IDC report outlines a number of roadblocks board manufacturers may face.

According to the report, the boards are likely to serve only as an interim solution to users' communications problems. As standards for local-area networks, gateways and IBM's LU 6.2 protocol become better defined and are embodied in available products, stand-alone emulation boards may become an outdated solution for tying personal computers to larger host systems. The report was based on questionnaires mailed to all domestic terminal emulation manufacturers, in-depth phone interviews with some 20 vendors, as well as IDC's display market data and its 1986 IBM Migration Survey, a comprehensive questionnaire mailed to 13,000 sites.

Information on the report, "Terminal Emulation Boards for Personal Computers," is available from International Data Corp., 5 Speen St., Framingham, Mass. 01701.

Control from **page 13**

equipment to a new piece and test the new connections. If it doesn't function as planned, the user is able to switch back to the old equipment.

A matrix switch typically replaces manual patch panels, although some vendors incorporate patch panels in their matrix switches. The network operator controls line switching, so the end user may not even know the matrix switch exists.

Until recently, matrix switches were typically used only at central data processing sites, and most switches support 512 incoming lines and 512 outgoing ports. In the last few years, vendors have expanded their offerings. Large switches support up to 2,000 connections, and small switches control as few as 64 connections.

The smaller devices were specifically designed for small remote sites, and the switches are being used in distributed DP applications (see chart). Matrix Switch A is at a central site with two smaller matrices monitoring lines at Remote Locations B and C.

A matrix switch can be used to monitor lines and to switch equipment. A network operator can view the status of interface leads both at the local and remote matrix switch.

Whenever more information is required, an operator can access a local or remote matrix switch and analyze data or communications protocols. This monitoring function can be accomplished in real time at remote sites (see chart). An operator at Matrix Switch A can command Matrix Switch C to access a specific line and connect it to a test port without interrupting any of the other lines. The specified port communicates with a data analyzer that is connected by modem links to an analyzer at Matrix Switch A. In this configuration, an operator is able to observe any interface at any remote matrix switch.

This capability supplies two benefits. Companies do not need network operator personnel at the remote site, and central tests can be run more effectively.

Most matrix switches have loop-back capability. Through these tests, operators can isolate a defective network component. This elementary loop-back test is not within the reach of intelligent modems that use in-band or out-of-band diagnostics. These devices require wraparound boxes to supply a complete diagnostic picture.

A loop-back test at each end of a modem link supplies a true interface-to-interface test and leaves little doubt about where the defective equipment is located. Instead of being a competitive choice, matrix switching and intelligent modems often complement each other.

Various matrix switches have network management options that use a data base to store network control statistics. Managers can use these systems for information management, another basic network management function. Operators can work with equipment that is as simple as an asynchronous terminal or as complex as a dedicated minicomputer.

Last of all, many vendors are supplying performance monitoring features in their matrix switches. Performance monitors supply response time and capacity planning statistics that network managers can use in planning and operating their networks.

Since a matrix switch supplies all five basic network control functions and can be used with a variety of equipment, using a matrix switch for network management may be an appropriate choice at many organizations.

FACTORY COMMUNICATIONS

"GM did have a basic plan for a large communications network. [Electronic Data Systems Corp.] stepped in and began to execute the plan. We have increased network savings by redirecting some of the dollars that were going outside the company to projects that EDS can complete itself.

Clay Johnson
vice-president
Communications Services Division
Electronic Data Systems Corp.

SOURCE: ELECTRONIC DATA SYSTEMS CORP., DALLAS

▶MANUFACTURING

EDS building worldwide net

Firm relying on grab bag of digital technologies in building GM network.

BY BOB WALLACE
Senior Writer

With the aid of virtually every major digital transmission technology currently available, Electronic Data Systems Corp. (EDS) is constructing a massive digital communications network that will link General Motors Corp. facilities around the world.

The world's largest automaker acquired EDS, a software and services company, in 1984. Much attention has already been drawn to EDS' work on a three-tier digital communications network that will interconnect upwards of 600 private branch exchanges in GM sites around the U.S. EDS has also linked numerous GM locations in the UK and Europe to the company's Detroit world headquarters.

According to Clay Johnson, communications services division vice-president for EDS, 35% of GM's domestic digital network is operational. He added that more than half the implementation work has been completed.

GM gives EDS an annual budget of roughly $375 million to $750 million for communications-related expenses and investments. Johnson claimed one-half to two-thirds of EDS' total staff of 44,000 is currently dedicated to serving GM. Even though EDS is still scrambling to create communications systems to fit new applications, the company is planning to break ground on two enormous network-management and customer-service centers.

When EDS took over GM's communications network responsibilities, supporting the corporation's voice communications needs was the impetus behind network growth. Johnson claimed this situation is quickly changing.

"GM was typical of large companies where voice communications comprised 80% to 90% of the company's communications traffic, while data traffic made up 10% to 20%," he said. "As automation moves to GM factories and manufacturing equipment is tied into the communications network, data traffic will eventually increase to one-half of GM's communications traffic."

Johnson said the construction of a digital microwave network that serves 25 separate locations in southern Michigan is an example of the emerging role of data communications in the GM network. "When this network was first conceived,

See **EDS** page 16

FACTORY FACTS
BOB WALLACE

Teased users wary of vendor hype

Product hype hurts.

If a user court were convened to determine whether vendors had improperly hyped their products, many would be found guilty.

A case in point: Corvus Systems, Inc. recently distributed a press release about a product the company claims will not be commercially available until the fourth quarter of this year.

The release did not list a single feature of the "networking product." The company flatly refused to discuss any aspect of this mystery product. Attempts to play the question-and-answer game of "What's my product?" failed miserably. It appears the company had authored a release designed to generate publicity and tease users, but would not elaborate on the yet-to-be-announced product.

These preannouncements are not unique to the telecommunications and data communications industries; they are also common to the Manufacturing Automation Protocol product marketplace. In the MAP industry, companies often announce they will support the factory communications standard; then they announce they will produce MAP-compatible products; and finally, they make the products commercially available.

Sadly, the user is often the loser. Unrestrained product hype breeds confusion in the minds of users. Confused users either delay buying or do not buy products they do not understand.

Users hit by runaway marketing campaigns usually get the license number of the vehicle that hit them. In other words, vendors stand to lose a great deal when users cancel or delay product purchases.

Vendors planning to hype an upcoming product should be read the Ztel story before bedtime. The Ztel story is a story about a little private branch exchange vendor that couldn't — couldn't produce a product that could live up to the company's wildly exaggerated marketing claims, that is.

Ztel, Inc. frittered away $52 million in start-up funds before filing for reorganization under Chapter 11 of the Federal Bankruptcy Act in May 1985. This switch manufacturer has been working for months to make users forget about its storied past.

This is not to say that vendors who are overzealous in peddling their products will end up on the poor farm. Vendors should just remember that product hype often does more damage than it does good.

See **Hype** page 16

INCIDENTALS

The Society of Manufacturing Engineers' Sensors '86 Conference and Exposition will again be held in conjunction with the Autofact show. Sensors '86 will be held at the Westin Hotel in Detroit, Nov. 11 to 13; Autofact will be held at Cobo Hall in Detroit. For further information about Sensors '86, contact Larry LaFerte at (313) 271-1500 ext. 356, or Pat Soter at ext. 337.

*

Ford Motor Co. has developed a computer artificial intelligence program designed, in part, to enable plant operating personnel to learn about the technology at a faster clip than before.

John A. Betti, executive vice-president of technical affairs and operating staffs, said, "The Ford Robotics and Automation and Applications Consulting Center has developed a low-cost expert system that will permit plant employees to diagnose and repair robots without undergoing lengthy and expensive training."

The nation's Number 2 automaker plans to have 5,000 to 7,000 robots in use worldwide by 1990, compared with roughly 3,000 now.

*

The Oliver Wight Companies has announced the availability of a book entitled *High Performance Purchasing: Manufacturing Resource Planning for the Purchasing Professional*, written by John Schorr and Thomas Wallace. According to the company, the approach outlined in the book enables buyers to work at peak performance, helping their companies become competitive in an international marketplace. The typical manufacturing company spends three dollars on purchased materials for every one dollar on direct labor. However, most buyers today are bogged down in expediting, shuffling paperwork and responding to crises. The book costs $35. For additional information, call Jan Andrew at (212) 947-9898.

*

Apollo Computer, Inc. recently announced its intentions to incorporate the latest version of AT&T's Unix System V Release 3 operating system into Apollo's Domain/IX operating system.

*

Hewlett-Packard Co. recently announced an agreement that will permit Carnegie Group, Inc. to offer its Knowledge Craft artificial intelligence system development software on the HP 9000 Model 320 technical workstation. Knowledge Craft software will be part of the HP Plus Software program and will be distributed by Carnegie Group. The Model 320 port of Knowledge Craft, which will be available later this year, will cost $50,000.

▶ INDUSTRY AGREEMENTS

Accord in works to enable interface link to AT&T wiring plan

System provides building management over twisted-pair telephone network.

BY BOB WALLACE
Senior Writer

AT&T Information Systems and Johnson Controls, Inc. of Milwaukee, Wis., are working to establish an agreement that would enable Johnson Controls' JC/Link communications interface to connect with AT&T's Premises Distribution System (PDS).

A twisted-pair, fiber scheme

PDS is a wiring and cable plan that provides a transmission network for one or more buildings. A variety of communications and data processing equipment can be connected to the twisted-pair wire and fiber-optic cable-based wiring scheme.

The JC/Link communications interface enables users to operate the JC/85 Building Automation System over a twisted-pair wire-based telephone network.

The JC/85 system performs heating, ventilating, energy management, security, lighting and maintenance management control functions.

The first AT&T/Johnson Controls installation using the JC/85, JC/Link and an AT&T twisted-pair wiring plant is reportedly operating at the University of Maine at Orono.

Hype from **page 15**

Users are beginning to recognize brochureware or vaporware when they first hear about it. They are wary of companies that preannounce products and services. Many vendors, including IBM and Digital Equipment Corp., won't comment on unannounced products.

As the old saying goes, "Fool me once, shame on you. Fool me twice, shame on me."

EDS from **page 15**

the driving force was to support plain old telephone service. But GM's [computer-aided design and manufacturing] requirements blossomed to the point where the telephone company couldn't handle the situation. So we handled it ourselves." What was envisioned as a voice communications net has become a predominantly data net.

EDS plans to wean GM off the facilities of the local and long-distance carriers wherever possible. Johnson said the majority of EDS' connections still belong to common carriers. "We pay carriers $200 million a year," he said. "They will always get 30% to 40% of our business." EDS has lessened each GM facility's reliance on telephone company services by installing duplicate facilities, switching the site's users to the new service and removing the telephone company facilities.

Johnson explained that EDS will simultaneously construct a central network management center near its headquarters in Dallas and a companion facility near Detroit. The two facilities will be completed in late 1987, he predicted. Other backup network management centers will be used, in part, to off-load work from the two major locations. The distribution of network management facilities will decrease the possibility of a natural or man-made disaster crippling EDS' ability to control GM's mammoth communications network.

Very small aperture terminal technology has also caught the eye of the EDS systems planner. Johnson said he would connect several thousand GM locations to GM's headquarters through Vsats if the cost of Vsats dropped significantly. He also said that if EDS opts to implement a Vsat net, the company will install and operate the system itself. Currently, most Vsat net users lease services from a satellite services vendor.

"If the price of individual Vsats reached $10,000 and the Vsat performed all functions I wanted it to perform, we might install them," he said. Johnson claimed GM already uses more than 100 satellite earth stations, but he added that if several thousand Vsats were installed, GM would pursue an agreement with its Hughes Aircraft Co. subsidiary for a satellite to be used specifically by GM.

GM's domestic communications network also makes substantial use of fiber-optic cable-based systems. Johnson said Michigan Bell installed a fiber-optic network in Flint, Mich., that is now leased by EDS. "We tend to use fiber in campus-type environments," Johnson said. All buildings in GM's advanced engineering division in Warren, Mich., and all buildings at EDS' world headquarters near Dallas are connected using fiber-optic cable. Both lightwave systems are owned by EDS.

Johnson added that EDS is likely to do business with several of the members of the National Telecommunications Network in the future. The fiber facilities owned by the regional fiber-optic carriers will be used to connect GM facilities in certain areas.

EDS also makes use of digital microwave links. One such link connects GM plants in Detroit to plants in Pontiac, Mich. This technology is also being considered as a means of linking two or more of the nine digital network hubs planned for use within the U.S. digital network (see chart on page 15).

Although the GM network employs several major transmission technologies, EDS has not made much use of cable television systems. A CATV system is a coaxial cable-based network that connects several buildings in a specific metropolitan area. Some companies, such as Wang Laboratories, Inc. in Lowell, Mass., have contracted with CATV system operators to build coaxial systems that link buildings separated by short distances.

On an international scale, GM's world headquarters in Detroit is linked to GM's headquarters in England via a dedicated 1.544 bit/sec satellite link provided by Communications Satellite Corp. (Comsat). A second T-1 link will be added by year end. Johnson claimed EDS does not currently own any transmission facilities overseas. In Europe, EDS leases transmission facilities from a number of Postal Telephone and Telegraphs. Johnson said EDS has leased services from both British Telecommunications PLC and Mercury Communications Ltd. for GM's data network in England. GM's Zaragoza facility in Spain and GM's Opel facility in Russelsheim, West Germany, are linked to the U.S. .

The international communications and U.S. operations area manager for EDS, Conrad Konsitzke, said Antwerp, Belgium, currently serves as the hub of GM's European network. A series of conditioned four-wire lines are used to support voice communications during the daytime and data communications in the evening, he explained. These lines can support data communications at speeds of up to 16.2K bit/sec. Konsitzke said several European locations are connected to GM's digital communications network via trans-Atlantic undersea cables.

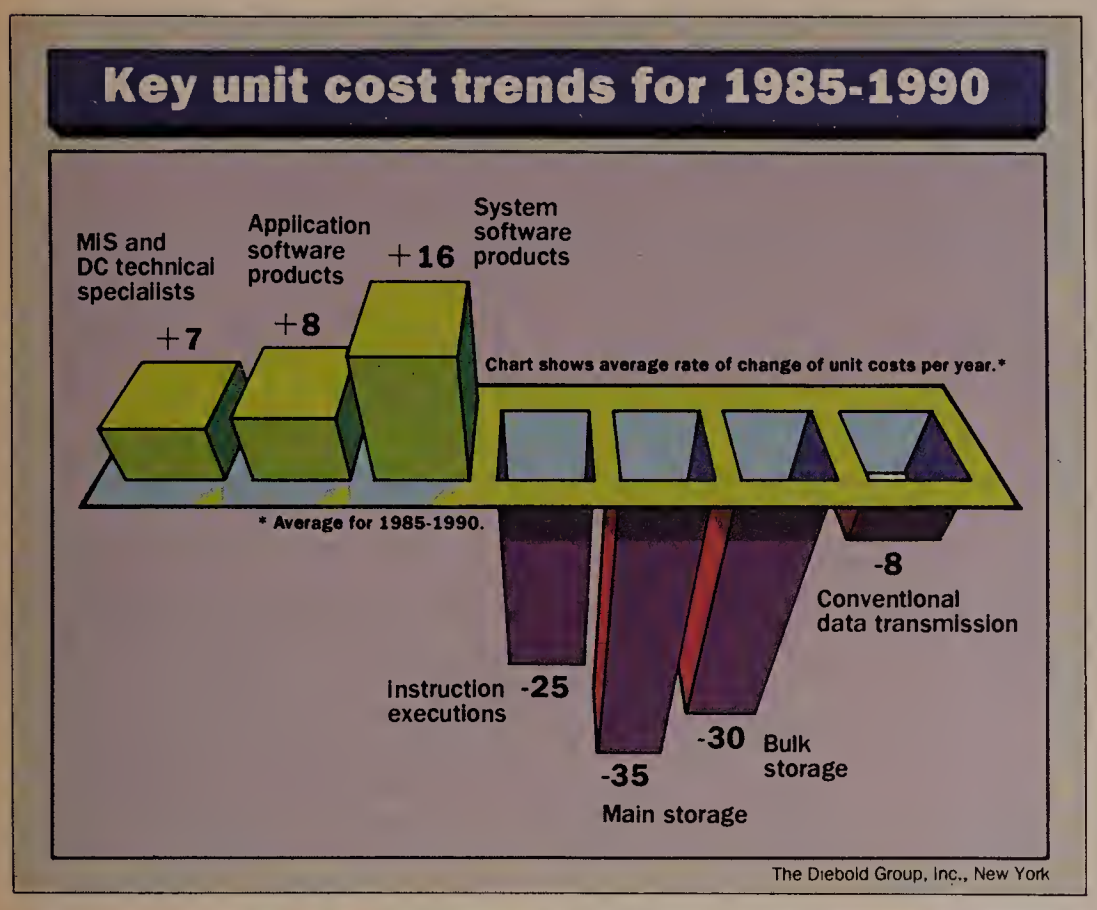
Konsitzke added that EDS will implement a miniature version of GM's domestic digital communications network in Europe in three phases. High-speed links between the U.S. and the UK are being established in the first phase of the project. The UK will also be linked to several sites in Europe. In the second phase of the effort, EDS will replace existing terrestrial lines on the continent with direct links from the UK. Finally, the digital lines connecting sites in European cities will be linked to the UK. Communications between these cities and London will be routed to the U.S. over satellite links.

Johnson claims EDS has two advantages over current long-distance carriers offering services to GM. "The first advantage is that I know who my customer is," he said. "I don't have to worry whether or not GM is going to buy services from me. My second advantage is that there isn't any old technology hanging around my neck that I haven't depreciated yet."

COMMUNICATIONS MANAGER

"Getting good people to work for you may be expensive, but you can do a lot of work with a few good people. You may have a lot of mediocre people, but you may not get much work done.

Steve Esselstyne
manager
Information Technology Services
Stanford University
Palo Alto, Calif.



RECRUITING

Unique hiring tack a success

Stanford chief offers innovative tips.

BY MARGIE SEMILOF
Senior Writer

PALO ALTO, Calif. — Instead of complaining about the short supply of talented network technicians, a Stanford University communications manager has been successful at hiring by applying a little craftiness and versatility to the hunt.

Steve Esselstyne is manager of Stanford University's roughly 65-member Information Technology Services staff. Stanford became a recognized leader in communications technology in 1985 when the school implemented a 23-mile digital, campuswide network to serve users on its campus here. Esselstyne's computer services staff inherited responsibility for the university's telephone system, which is based on a new Northern Tele-

See **Stanford** page 18

PEOPLE

Sam Rostock was appointed corporate controller for C-Tec Corp., formerly Commonwealth Telephone Enterprises. He was most recently acting corporate controller at C-Tec.

Howard Tyska has been appointed vice-president of communications services for Household Financial Services, the financial services and insurance arm of Household International, Inc.

Tyska was formerly group manager of network administration for Baxter-Travenol Laboratories, Inc.

Britton Lee, Inc. announced that it has promoted General Counsel **Clement Bosch** to vice-president and general counsel. Bosch was formerly counsel at Masstor Systems Corp.

R. Bruce Renda, dean and professor of electrical and mechanical engineering at Purdue University's School of Engineering and Technology, has been elected to the board of directors of Dilog Corp.

Martin Marietta Corp. appointed **Gerald Thames** vice-president of communications systems for its information and communications company.

Mark Miller was named director of customer service at Televideo Systems, Inc.

Rolf Soderstrom was named executive vice-president of Codex Corp. Most recently he was senior vice-president and general manager of product operations.

GUIDELINES

ERIC SCHMALL

Shared equipment stockpile cuts costs, guards against crash crunch

The concept of communications users establishing and sharing regional pools of equipment that are stockpiled for emergency use is a positive step toward building an effective company disaster recovery plan.

The equipment bank concept is being explored by some Racal-Milgo, Inc. User Group (Rmug) members who say they believe the plan will help guard against extended and expensive network downtime. The Rmug users want to share a modem pool and split the cost of the network tools and storage space with other Racal-Milgo users in nearby locations.

Although details for the plan have yet to be hammered out, the Rmug users propose locating inventory storage sites in hub-type facilities within easy reach of each regional group. So far, possible sites for the proposed equipment pools are within some of Racal-Milgo's 26 regional stocking centers, airports and warehouses close to the vendor's regional center or user company.

One cost-cutting possibility for users is to purchase equipment from the refurbished stock that Racal-Milgo brings in from expired leasing agreements. The equipment could be matched with a group of customers in one geographic location. For example, a congregation of users may require backup services of a specific product no longer manufactured. Users could obtain some of this equipment from the vendor and draw from this equipment pool in the event of a network breakdown.

One of the biggest benefits to these user stockpiles is that each agreement between the users and the vendor could be customized. Users may choose to have service contracts to provide vendor technical support, or they can use their own personnel to fetch and install the backup equipment.

> *"As users push their equipment to higher speeds, they risk bigger losses when nets crash."*

If the Rmug members and Racal-Milgo pull this idea together, there is no reason why the establishment of shared equipment pools wouldn't appeal to users of another communications manufacturer's equipment. The variety of equipment can be expanded to include not just modems, but T-1 and statistical multiplexers and possibly some switching equipment.

Companies that suffer tremendous losses during network downtime, such as banking institutions and airlines, would be the biggest beneficiaries of this plan.

Ted Pace, Racal-Milgo's director of field service operations, says he thinks vendors would like the concept because it helps solve the problem of storing excess inventory.

As users push their equipment to higher speeds, they risk bigger losses when their networks crash. Shared equipment sites could be an effective component to a company's overall disaster plan.

Schmall is network systems manager for an insurance holding company.

▶ STC CONFERENCE

Communications consultants view management as key issue

Experts must help users develop executive skills.

BY NADINE WANDZILAK
Staff Writer

ATLANTA — Management is a key issue for communications consultants as well as the communications managers who seek their help, according to speakers at the 10th anniversary spring conference of the Society of Telecommunications Consultants (STC) held here May 29 through June 1.

The conference offered STC members sessions on managing their practices and updates on T-1 transmissions, Centrex, central office local-area networks, net management and IBM compatibility.

Many corporate communications managers are interested in what's new in the technological logical zoo, according to STC President Charles Abbott.

But they are even more interested in the management side of the coin, for example, making telecommunications more noticeable to management and getting a slice of the corporate budget pie, Abbott said during an interview at the conference. "Communications managers in larger companies are looking to us to develop them managerially."

> *"Managers should set standards to meet technology needs."*

Communications managers are not as caught up in technological hype as they were at the time of divestiture, agreed STC Director Allan Shontz of TelCon Associates, of St. Louis, Inc. They have been maturing since then, he said. Managers in any area, not just communications, should set requirements for technology to meet their needs. They should simultaneously maximize the bottom line, Shontz said.

The STC itself is experiencing a "startling" increase in membership, Abbott told members. "Just to survive for 10 years is something to think about," Abbott said in his welcoming speech. "To gain prestige is new and different." Abbott attributed the growth to the organization's code of ethics. The number of applications for membership has doubled to about 60 each year, Abbott said, bringing the number of members to some 215.

In much the same way that voice and data communications were technologically integrated, Abbott said he can see telecommunications and computer consultants sharing the umbrella of office automation experts.

COURSES

A brochure designed to help users work more comfortably at VDT terminals has been released by The Center for Office Technology.

Working with Displays: A Practical Guide for VDT Users covers such subjects as chair adjustment, organization of the work area, display adjustments, light control and the use of document holders.

For information on obtaining a copy of the brochure, contact The Center for Office Technology at (202) 452-9060.

Introductory telecommunications courses for managers will be offered this summer by Datapro Research Corp.

Participants can earn Continuing Education Units, which are nationally recognized standard units of measurement earned for satisfactory completion of qualified programs.

Telecommunications II, Integrated Voice and Data and Digital Private Branch Exchanges will be held June 26-27 in Newport Beach, Calif.

Telecommunications Management, Equipment and Service Selection will be held Sept. 11-12 in Chicago; Sept. 18-19 in New York.

Information on additional classes and dates is available.

For more information on accreditation, team discounts, customized in-house programs and registration, contact Datapro Research Corp. Educational Services, 1805 Underwood Blvd., Delran, N.J., or call (800) DATAPRO.

Unattended auto dial back-up modems work when your leased lines don't.

When you need fail-safe data communication for your critical applications, you need AJ's unattended auto dial backup modems.

Models are available for 4800, 9600, and 14,400 bps. They continuously monitor the lines. When they sense carrier loss or degradation of signal quality, they automatically dial stored numbers and communications resume over the dial-up line.

They even automatically restore communications to the leased line when conditions improve.

For details on AJ fail-safe data communications send the coupon.

ANDERSON JACOBSON

Please send FREE information on the following:

☐ AJ 4048-2 (4800 bps) ☐ AJ 9601 (9600 bps) ☐ AJ 1411 (14.4 kbps)

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Phone (___) _____

Anderson Jacobson, Inc., 521 Charcot Avenue, San Jose, California 95131, (408) 435-8520.

Stanford from **page 17**

com, Inc. SL1 digital private branch exchange.

When it comes to staffing, Esselstyne eschews traditional hiring methods. Instead, he has embraced some innovative approaches to nabbing talented employees and cross-training existing ones.

"While it is always possible to lure communications employees through traditional methods, such as newspaper advertisements or peer networking," Esselstyne said, "those tactics are better suited to hiring accountants."

Rather than beat the bushes for prospective employees, Esselstyne prefers to take advantage of the pool of trained technicians already employed by the vendors with which Stanford is associated. He cited the phone company as a prime source for trained voice and data technicians, primarily because those technicians have years of networking experience.

In fact, Esselstyne himself scooped up most of his original voice and data staff after divestiture, when many technicians lost their jobs as a result of AT&T's organizational reshuffling.

He said it is easier these days for first-time switch buyers to entice phone company service technicians to join their corporate communications staffs. "Jobs at the phone company are not as secure as they used to be," Esselstyne said, "and there is a lot of ship jumping going on.

"Those technicians already know your wire schemes and networking needs," he added. "If you can find technicians who worked on your data equipment, it makes sense to lure them on board. Once those key technicians are in place, they can help you recruit additional employees and prepare a strategic plan."

Vendor-employed equipment-installation teams are another rich source of trained personnel. Often, large vendors contract with outside technicians to install wiring and switches, and to perform final testing of the equipment. Once the installation is completed, the contract technicians are often released by their employer.

"We probably had 100 people coming and going during one installation," he said. "After the job was complete, we asked some of those technicians to work for Stanford. All they had to do was keep on doing what they had been doing. They had the training and they were familiar with our location."

Esselstyne's scouting method also gives him an unusual opportunity to assess the skills of potential job candidates without investing any additional time or risk. When it comes to training, Esselstyne offered a few caveats to users considering classroom education. He suggests choosing a few theory classes that give workers exposure to communications buzzwords and general concepts. He also cautions managers to avoid classes that try to cram in too much information in a short time.

"Select seminars that are specific, such as those on T-1 technology or IBM SNA controllers," he said. "Don't send your employees to seminars that try to teach everything anyone ever wanted to know about data communications or phone systems."

Esselstyne said the most comprehensive training should be provided by existing staff members who are familiar with the intricacies of the organization's networking scheme. Companies buying a switch for the first time should either assign their key voice and data people the task of training new employees or rely on outside educators.

"New employees should start out with training on basic networking technology principles coupled with liberal on-the-job experience," Esselstyne said.

"When you move onto the next phase, dole out some theory and supplement it with more on-the-job training.

"Getting good people to work for you may be expensive," he added. "But you can do a lot of work with a few good people. It may be easier to get a lot of mediocre people, but you may not get much work done."

NEW PRODUCTS AND SERVICES

▶See 1,200 bit/sec modem product focus, page 24
▶T-1 multiplexer product focus in June 21 issue

▶ BBN COMMUNICATIONS

X.25 net fortified

Security features limit user access to network devices.

CAMBRIDGE, Mass. — BBN Communications Corp., a subsidiary of Bolt Baranek and Newman, Inc. released security features to control access to its wide-area X.25 packet-switching network and to limit the number of devices a network user can access.

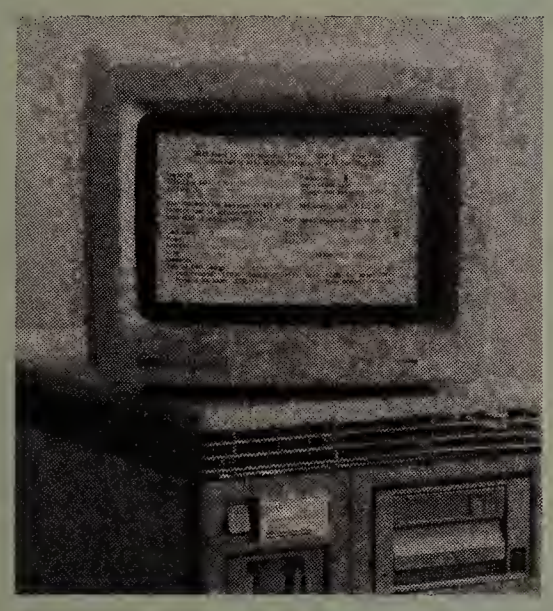
The Network Access System (NAS) is comprised of two components: a centrally located Master Data Base (MDB) host and any number of geographically dispersed Access Control Server (ACS) hosts.

The MDB host contains information on authorized network users and applications users can access. The relational data base management functions of the MDB host allows network administrators to query for detailed network usage reports and edit the data base to update network users or change entire network password security. Administration and management of the NAS is performed at the MDB host.

The ACS host looks at user logon requests received from a packet assembler/disassembler (PAD), a packet switch or a gateway and compares the user name and password against its authentication data base. If the access is legal, the ACS determines which network device or application the user has been given clearance to access. The ACS then either directly connects the user to the single point to which it has access or asks the user to declare connection to one of the several network points it can access.

The ACS compiles and sends data concerning each logon to the system administrator for call accounting and other purposes via a BBN Communications Network Operation Center. Information concerning failed logon requests is also compiled and sent to the administrator.

The NAS supports logon requests issued from BBN Communications C/10 asynchronous and bisynchronous PADs, any asynchronous PAD or host that emulates an asynchronous PAD supporting X.3, X.28 and X.29, and any asynchronous PAD that accesses the network through a BBN Communications Multicom Gateway.



Both the MDB host and ACS host are based in Digital Equipment Corp. MicroVAX II microcomputer hardware and connect to the X.25 network through RS-232-C interfaces transmitting at 19.2K bit/sec.

A NAS system containing one MDB host and one ACS host lists for $235,500. Each additional ACS host costs $89,000.

▶ SYBASE

Server software debuts

Supports data base machine functions.

BY JIM BROWN
New Products Editor

BOSTON — Software that enables a superminicomputer or a supermicrocomputer to act like a data base machine was announced here and in New York last week by Sybase, Inc.

Sybase's structured query language (SQL)-based data base management system (DBMS) is comprised of two packages, Data Server and Data Workbench, which run on Ethernet networks. The software was designed to run under various operating systems and to talk over a network using that operating system's networking protocol. "We're not writing our own network drivers. We're just taking advantage of what is already there," said Donna Jeker, Sybase product marketing manager.

The Data Server software turns a general-purpose, 32-bit computer into a specialized data base network server that the company said will support more than 100 users. The Data Server becomes the central repository for data bases, and it is where Sybase's DBMS applications are stored. Data base management administrators can install security features and define data integrity rules on the Data Server. Backup, structure changes and updates to the data base can be performed while the Data Server continues to function.

The Data Workbench software, installed in local personal computers, workstations or minicomputers, uses a visually oriented query language to build a packet of SQL commands, which are sent to the Data Server. The Data Server processes the commands, compiles a response packet and sends it back to the Data Workbench that made the query. The Data Workbench software uses pull-down menus and windows operated with a mouse device or function keys to compile reports, prepare custom applications or data displays.

Officials from the one-year-old firm said initial product offerings this fall will include a Data Server version for Sun Microsystems, Inc.'s Sun 3 workstations running under BSD Unix release 4.2 and a Data Workbench for bit-mapped and Digital Equipment Corp. VT-100-compatible terminals. Products supporting other vendors' equipment and network protocols are under development with releases of software running under DEC VAX VMS and Ultrix operating systems planned for late 1986. Depending on the size of the central processing unit, prices for the Data Server range from $18,000 to $90,000. Prices for the Data Workbench range from $1,000 to $30,000.

The Sun 3 workstation-based system will go into beta testing this summer at TRW, Inc., one of Sybase's capital investors.

▶SOFTWARE

NSA tool links PCs

Aids file transfers.

LAGUNA HILLS, Calif. — A software package supporting file transfers between personal computers has been released by Network Software Associates, Inc. (NSA). The firm also enhanced other personal computer communications software to operate in conjunction with Synchronous Data Link Control (SDLC) expansion boards manufactured by 15 different companies.

The menu-driven Synctalk package uses IBM SDLC communications protocol to support synchronous file transfer and communications between personal computers. A package must reside in each of the communicating personal computers. Any Synctalk-equipped personal computer with 256K bytes of memory and operating on IBM's PC-DOS operating system Release 2.0 or higher can initiate and control the communications link.

The software requires a personal computer SDLC adapter expansion board made by any of 15 vendors and a synchronous modem to make the peer-to-peer link over leased or dial-up telephone lines. The package also allows for the unattended use of a personal computer by supporting the execution of selected PC-DOS commands generated by a local personal computer on a remotely located personal computer. The package uses data compression techniques to transmit data at 9.6K bit/sec.

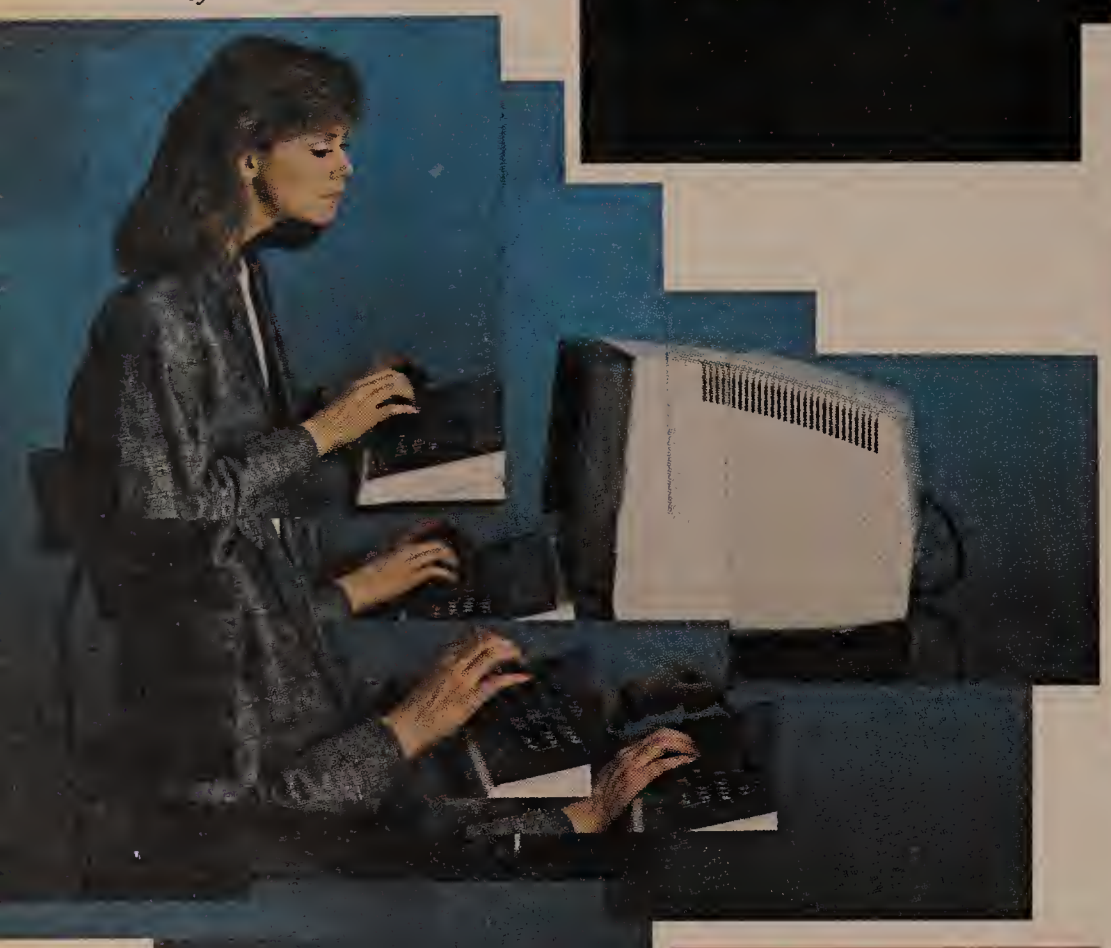
The package is offered in three purchase options. When purchased alone, the software costs $195. Purchasing the software and an NSA Adaptcom SDLC adapter expansion board costs $440. A complete system, consisting of NSA's Adaptmodem, an expansion board supporting both the SDLC adapter and a synchronous modem and the Synchtalk software, is priced at $990.

In addition to supporting IBM's and its own SLDC expansion boards, the Synctalk package will support SDLC boards made by, among others, AST Research, Inc., Emulex Corp., Forte Communications, Inc., Frontier Technologies Corp., Pathway Design, Inc., Techland Systems, Inc. and Wang Laboratories, Inc.

The company also said it released enhanced versions of its other SDLC-based communications software so that they support the same SDLC boards.

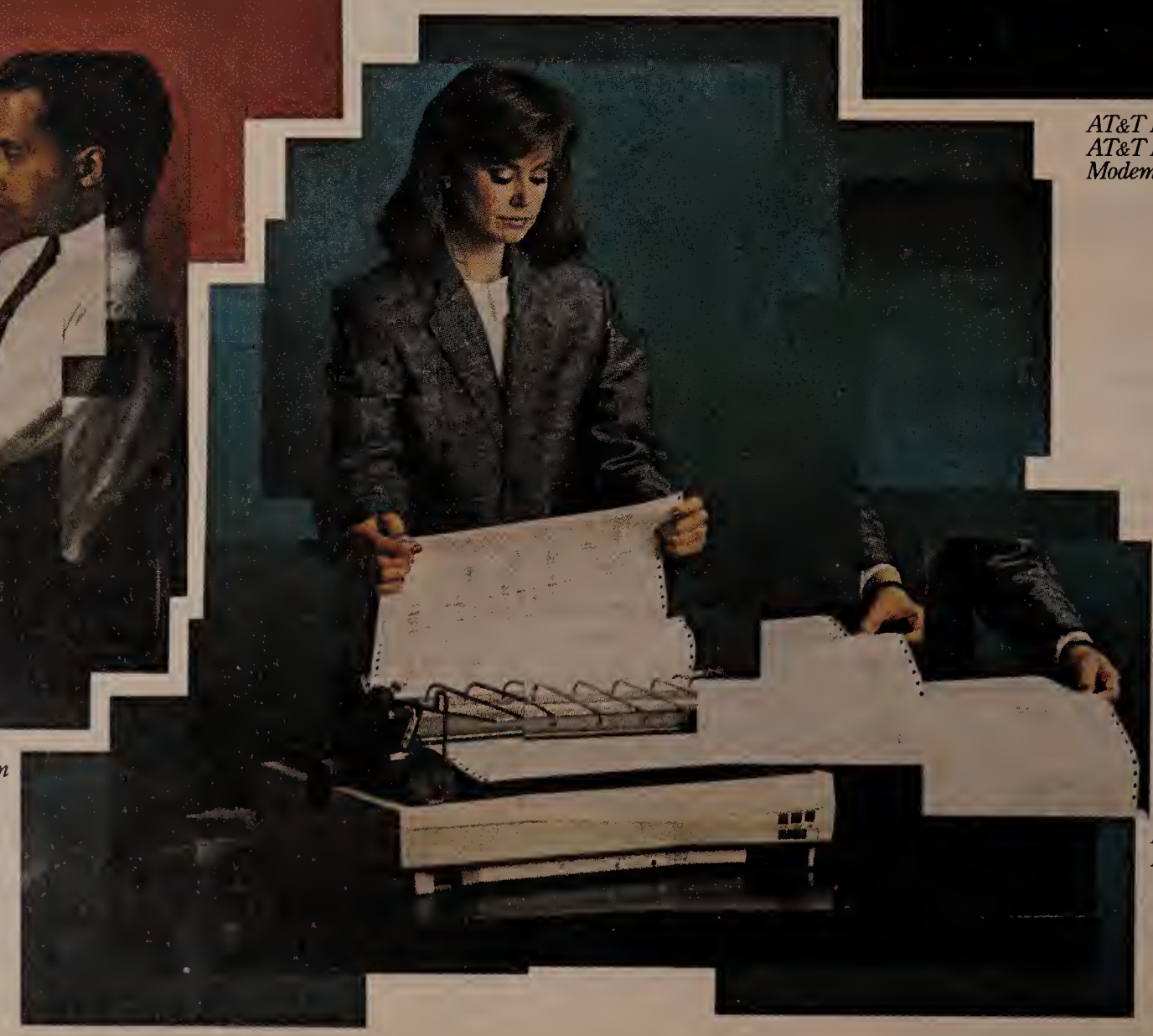
AT&T 724 Multiplexer

AT&T DATAPHONE II
System Controller



AT&T PC 6300
AT&T Model 4000
Modem

AT&T Multifunction Communication System



AT&T 455
Printer

©1986 AT&T Information Systems

How AT&T's unrivaled strength in communications helps you build a better information network.

AT&T's approach to network management and control reflects a century of communications experience. And a century of leadership.

Here's what it means to you.

Performance you can rely on. AT&T is the only company that offers you complete management of digital, analog and private line networks with *one* system—the evolving DATAPHONE® II system product line.

It's a full line of modems, Data Service Units and multiplexers that combine network managing and diagnostic capabilities to deliver maximum uptime from an integrated *system*.

The mainframe connection. When you're in the 3270 environment, the AT&T 6500 Multifunction Communication System makes a lot of sense. Full compatibility, access to multiple synchronous or asynchronous hosts, plus powerful multitasking, put maximum mainframe muscle on the desktop.

AT&T 3B Computers working with our BSC/SNA connectivity software give you departmental processing of mainframe data.

We make the pieces fit. Flexibility and adaptability set AT&T networks apart in both local and departmental use. Systems like the AT&T STARLAN NETWORK and 3B NET give you the network best suited to corporate requirements with no sacrifice in control of your computer resources.

And with our Information Systems Network (ISN), you can even link your current systems and networks to equipment from other manufacturers.

Computers made to communicate. Both the AT&T PC 6300 line and the AT&T **UNIX**™ PC merge computing with communications. Optional or built-in modems and communications management software make simultaneous voice and data exchanges as simple as a few keystrokes.

And thanks to **UNIX** System V, the entire AT&T 3B Computer family offers integrated and flexible communications for departmental computing solutions.

A compatible family. AT&T **UNIX** System V-based computers are compatible within the line. And beyond that, AT&T offers computers, terminals and printers that are operationally compatible with accepted market standards.

The results are easy integration as well as protection for your existing hardware and software investments.

The computers with the future built in. As your needs change and technology advances, AT&T network management products will provide accommodation without obsolescence.

To learn more, call your AT&T Information Systems Account Executive, your authorized AT&T supplier or simply dial 1 800 247-1212.

Because when you invest in information, we think you deserve a continuing return.

AT&T
The right choice.

Should intrastate telephone rates be deregulated?

PRO:

BY RON SLYTER
Special to Network World

Should all intrastate telephone service be deregulated? From the consumer's and supplier's points of view, the answer is yes.

Most businesses in the U.S. operate in open, competitive markets characterized by a lack of restrictions to entry and the absence of regulation. Suppliers gain competitive advantages by introducing new products, unique services and attractive prices to customers. Unregulated, competitive markets offer suppliers and consumers freedom of choice.

Consumers are the driving force behind open markets, and they serve as the ultimate regulator. Consumers vote directly every day on whether to support a particular service or product with their purchases. In a free and competitive market, consumers do not need government bureaucrats to decide what services and prices should be offered. This system works well.

Slyter is a general attorney with Northwestern Bell Corp.

Since its beginnings, the telephone industry has undergone dramatic technological changes. Today, telephones and computers are variations of the same technologies, while the telephone and computer businesses have merged as an information systems industry.

This merger of technologies has introduced new competition to the telecommunications industry at an accelerated pace. As a result, the telephone industry is rapidly undergoing a transition from common carrier-regulated monopoly status to a competitive industry. The challenge is to make the transition from a regulated system to a free enterprise system without unduly penalizing customers or suppliers.

Unfortunately, some regulators do not understand one basic fact: The regulated common-carrier system is totally incompatible with the open-entry competitive system.

Under regulation, telephone service comes from a defined monopoly, where the government selects services and sets prices. The customer has no choice.

The competitive system's revenues come from sales gained through suppliers' efficiency, innovation, uniqueness in service and prices that customers are willing to pay. Clearly, the regulated common-carrier system cannot coexist with a competitive open-market system.

Typically, regulators determine the monopolist's total revenue needs by allowing for all reasonable and necessary costs, plus a reasonable return on investment. However, the costs of providing a particular service and the amount of service a customer uses may not determine its price. Instead, rates are frequently based on the regulator's political or social views.

Regulators use highly legalistic procedures to determine ordinary marketing decisions. Such procedures may be appropriate for lawsuits, but they are unnecessary and wasteful for business decisions. For example, it might take a supplier about an hour to decide how to price a new service. A consumer might take 15 minutes to decide whether to purchase it.

But under cumbersome regulatory procedures, it could take dozens of lawyers, economists, accountants, consultants and state public utilities commissioners and staff to make a decision after they have

> *"In a free market, consumers do not need bureaucrats to decide what services should be offered."*

CON:

BY HAROLD D. SIMPSON
Special to Network World

Local telephone rates and services should remain regulated until competition becomes a reality.

Proponents of deregulation stress that both the public and the utilities will benefit from the dynamics and effects of deregulation. Benefits, they claim, include lower rates for service, increased innovation, a greater number of options and greater efficiency.

There can be benefits from deregulation only if deregulation is concomitant with the advent of true competition.

Most people are aware of the problems and abuses that inevitably result when a monopoly is allowed to operate with free rein in an unregulated environment, with no competition from other suppliers and no available substitute for that product or service. The reality, at least in Nebraska, is that there is no competition to the certificated local exchange carrier and there is no suitable substitute for basic telephone service.

Simpson is the first district commissioner and a former chairman of the Nebraska Public Service Commission.

For the forseeable future, residential and single-line business subscribers have no alternative to their local telephone company; they are captive customers. Their only alternative to paying painfully high monthly basic subscriber line rates is to discontinue service altogether. However, since having a telephone at one's home or business is a necessity, not a luxury, that alternative is unacceptable. Deregulation in the absence of competition spells trouble for the captive customer.

Some deregulation proponents argue that cable television and cellular mobile telecommunications systems are in competition with local telephone company service. However, in Nebraska, cable companies are not offering switched local communications, and cellular systems are not priced to compete with local service. Furthermore, cable and cellular service are offered in a very limited area.

The Nebraska unicameral legislature recently passed bill LB 835, which will effectively detariff all local rates and charges if it first survives a court challenge on its constitutionality. The bill would allow local exchange companies to raise monthly local access line rates up to their actual cost plus a return on their investment.

Although the bill purports to address competition, there is simply no competition at the local exchange level in Nebraska. Therefore, this bill's cost causative standard for setting rates will likely result in unbearably high monthly basic service rates for subscribers residing in sparsely populated areas. A resultant drop in subscribership is inevitable.

Northwestern Bell's parent company, US West, Inc., has already stated publicly that in Nebraska it would lower business rates and recover the difference by hiking residential rates. As residential basic service rates rise beyond the customers' ability to pay, a certain number of subscribers will drop out of the network. Universal service as we know it today would cease to exist, the number of persons accessible by phone would diminish, and the phones remaining in the network would become less valuable.

Compounding this problem is the issue of assigning non-traffic-sensitive costs. Under the Bell System monopoly, an artificially high percentage of non-traffic-sensitive costs were arbitrarily assigned to toll service. This allocation of costs permitted local rates to stay low and remain affordable to nearly all Americans. Such universal service is a clear public policy plainly stated in the Communications Act of 1934. Because nearly every American home has at least one telephone, the incentive for businesses to expand their network capabilities in order to tap potential customers remains high. All sides stand to gain from nearly 100% subscribership.

With competition in interstate and intrastate toll service, carriers are finding that the easiest way to compete is to reassign non-traffic-sensitive costs back to local business and residential service. They argue that local loops are entirely cost-causative for local service and that toll users over those loops should therefore not have to pay for that particular portion of the call route.

Only in theory does this accounting tactic wash. In Nebraska, one-third of all telephone subscribers make no toll calls, while another third make only intrastate calls. Two-thirds of the subscribers do not take advantage of the lower toll rates, yet are forced to pay end-user access charges that subsidize customers who make a large number of interstate calls.

In Nebraska, the $6 multiline business access charge and the $2 single-line access charge were assessed to subsidize large businesses that might otherwise be tempted to bypass the local telephone system.

examined hundreds of pages of testimony and exhibits. This is good for regulatory experts but is costly for consumers.

Regulated competition has proven to be totally unworkable. Once competitive, open entry into any major segment of a market is allowed, the regulator loses control. Unregulated suppliers and their customers react to marketplace economics. These suppliers design new services that skim off the best customers of the regulated common carriers and undercut the prices of services that are not based on costs.

Unequal application of regulations will allocate markets between suppliers. For example, if regulatory procedures are applied only to existing carriers, those carriers will not have the needed flexibility to respond to unregulated service suppliers. When a regulator sets the price for a service without a market price as a ceiling and a marginal cost as a floor, the regulator allocates the market between suppliers.

There is really only one basic

See **Pro** page 33

Another ingredient to factor into the equation showing the imminence of higher basic service rates is telephone companies' overcharging for optional and enhanced services to keep local rates down. For instance, Touch-Tone, call forwarding, call waiting and speed calling are priced up to five times their cost. In a competitive arena, prices of these services would drop substantially, and the lost revenues would be recovered through raising the basic service rates for captive customers.

One of the purported benefits of competition is lower rates. Competition for intrastate, intra-local access and transport area calls has not resulted in any price reductions

See **Con** page 33

Air your views

If a burning communications industry issue has you up in arms, write a guest column about it for *Network World*. Manuscripts must be letter quality, double-spaced and about 1,000 words in length. Disk and modem submissions are encouraged. Columns should be timely, controversial, literate and technically accurate. Contact Steve Moore, features editor, at *Network World*, Box 9171, 375 Cochituate Road, Framingham, Mass. 01701 or at (617) 879-0700 ext. 584.

MODERN MANAGEMENT

JAMES CARLINI

The search for integrity

This is the first of a four-part series that focuses on problems created by a lack of management integrity in various segments of the communications industry.

Many companies are not run well. Often, management becomes more a political anachronism than an efficient leadership force. Even the most dynamic managers can be stifled by superiors who are inept, uncaring and just plain incompetent.

Once an erosion of integrity has permeated top management, it may work its way down to the average worker and cause serious customer-relations problems. At that level, the cumulative impact of individual customer-relations problems — including those that at first glance seem trivial — can be great.

In the case of the regional Bell operating companies, lack of integrity is exhibited in a common phenomenon that can be thought of as an Rbotch, or regional Bell operating (telephone) company hassle.

Among the most common Rbotchs are: shoddy workmanship, especially in wire closets; attempts to avoid responsibility for problems by saying "It's not our job"; and poorly handled responses to calls for help or service.

One specific Rbotch came to light when, as Carlini & Associates, Inc. was establishing our office earlier this year, we did not check to see if the firm's main phone number had beenput into the directory assistance data base.

Almost two months later it was discovered that it had not, when someone called directory assistance and was told that the firm was not listed.

A call to the Illinois Bell business office on a Wednesday confirmed that there was a mistake. We were told that the directory would be updated by the following Monday.

On the following Tuesday, the listing was still nonexistent, so we called the president of Illinois Bell, and his executive assistant said that the number would be in by the end of the day.

The point here is that if you are having phone lines installed or changed, make sure the local operating company updates the directory assistance data base before you lose a lot of business.

When we asked about getting credit for not being in the directory, we were told that no credit for the mistake could be given because putting our number into the directory was a free service. But Illinois Bell charges 50 cents per call for directory assistance.

Perhaps those persons who tried calling directory assistance to get our number should ask Illinois Bell for a 50-cent refund for all calls made between Feb. 3 and April 1.

A second Rbotch surfaced when one of our clients needed some engineering information. We, in turn, needed to know how many cable pairs were running into five separate buildings.

We tracked down an engineering office after several misguided calls to and from Pacific Bell personnel who didn't have internal directories at their desks.

Finally, we spoke to an engineer who said that we would have to go through a marketing person. That marketing person, in turn, had to request the information from engineering. He gave us the name of the marketing manager and said emphatically, "Don't tell her who you got her name from.

"She'll kill me!" Pardon us, we didn't know one couldn't interrupt the marketing manager to discuss important phone company business for a customer.

When we called, no one was available except a service advisor who said, "We can't help you. That's a question for our engineering department." Finally, someone from another engineering office, which maintains records for other buildings, said he could deal with us directly and the information was provided in two weeks.

The question is, why do two engineering offices only a few miles apart have such disparate practices for helping customers?

Mountain Bell should give Pacific Bell some advice on how to run an engineering office. Mountain Bell's turnaround time on the same question for some buildings in Phoenix has been less than 24 hours. Bruce Starr, an outside plant engineer at Mountain Bell, exemplifies how good service can be when staff people and management know their jobs.

Some Pacific Bell installation managers and building industry consultants might benefit by practicing Management by Walking Around.

> *"Even the most dynamic managers can be stifled by inept superiors."*

We have taken photographs of wire closets with dangling connector blocks, graffiti, poorly installed wiring that is interwoven with electrical wiring and abandoned equipment and cabling. It's amazing that the phones work at all in some buildings.

The next time Pacific Bell asks for a rate hike because of higher labor costs, it should see some of the murals that its installers have etched on the walls of main distribution frame rooms.

We recently conducted a tour for one of Pacific Bell's building industry consultants. She was on the defensive at first — until she saw the magnitude of the problem.

Maybe some of the senior vice-presidents deserve the tour as well.

The moral of these Rbotchs is that concepts like "easy to do business with" and "100 years in the business means quality" are sometimes just hollow phrases that represent an unreachable ideal rather than a genuine application of management integrity.

Carlini is president of Carlini & Associates, a management consulting firm in Westmont, Ill.

NETWORK WORLD

Features

June 16, 1986

The 1,200 bit/sec modem market
As 2,400 bit/sec modems gain popularity, sales of 1,200 bit/sec modems are slackening. In response, vendors are adding new features to their 1,200 bit/sec units to help these low-speed modems compete more effectively for the many applications where high data rates are not essential.
This page.

What you don't know can hurt you
Software rights today are protected by copyrights, license agreements and patents, as well as lease and purchase agreements that are written or implied. Work contracted from employees or consultants should be protected with specific written contracts to ensure ownership rights and prevent litigation.
Page 1.

Fish, fowl or neither?
Key systems have come a long way since AT&T introduced its original 1A system in the 1930s. The potpourri of today's under-100-line telephone system market includes electronic key systems, hybrids and mini-PBXs.
Page 27.

PRODUCT FOCUS

The 1,2 moder

"The constantly increasing popularity of 2,400 bit/sec modems is weakening the 1,200 bit/sec market. The nation's largest value-added networks, Tymnet/McDonnell Douglas Network Systems, Inc. and GTE Telenet Communications Corp., are replacing existing 1,200 bit/sec modems with 2,400 bit/sec units. Worse yet, industry analysts claim current 1,200 bit/sec users are abandoning these devices."

BY BOB WALLACE
Senior Writer

If a company builds a better 1,200 bit/sec modem, will users beat a path to the company's door? The answer is maybe.

Because of the rapid proliferation of modems that operate at speeds of 2,400, 9.6K or 19.2K bit/sec, vendors of 1,200 bit/sec modems have been forced to stuff a variety of enhanced capabilities into their stand-alone and card modems.

Some units now feature several levels of security, adaptive equalization — a capability that allows the modem to transmit data over poor-quality telephone lines — and synchronous input capabilities (see charts right and page 26).

The constantly increasing popularity of 2,400 bit/sec modems is weakening the 1,200 bit/sec market. The nation's largest value-added networks, Tymnet/McDonnell Douglas Network Systems, Inc. and GTE Telenet Communications Corp., are replacing existing 1,200 bit/sec modems with the faster 2,400 bit/sec units. Worse yet, industry analysts claim that current 1,200 bit/sec users are abandoning these devices for faster units.

Market trends

A modem market study prepared by International Resource Development, Inc., a Norwalk, Conn.-based market resarch firm, predicts that, although sales in units of 1,200 bit/sec modems will increase in the next four years, the average price per unit will plummet from $200 this year to $50 in 1995.

The effect of this modem migration on vendors is unclear. The major players in the 1,200 bit/sec modem market also peddle 2,400 bit/sec modems. A decrease in usage of the lower speed modems decreases a vendor's market share in the 1,200 bit/sec market, but boosts his market share in the 2,400 bit/sec market.

Says Ken Konetski, product line manager for General Datacomm, Inc., "Every [1,200 bit/sec] modem maker is going to offer a 2,400 [bit/sec] modem as well. If a modem manufacturer decided only to build a 1,200 bit/sec modem, he would suffer from the popularity of 2,400 [bit/sec] modems."

Lee Wantroba, product family manager for AT&T Information Systems, says the proliferation of 2,400 bit/sec modems will drive down prices of the 1,200 bit/sec units.

Although 1,200 bit/sec modems are becoming cheaper every year, many of the units lack the features that would allow them to hold the line in the 1,200 bit/sec vs. 2,400 bit/sec modem market-share tug-of-war. Many 1,200 bit/sec modem vendors seem happy living in the asynchronous world; only a paltry number have designed their modems to accept synchronous data.

Several vendors have incorporated a version of adaptive equalization into their 1,200 bit/sec units. Using this technology, the modem samples the telephone line to which it is connected. If the line is of poor quality, the modem attempts to block out interference to ensure error-free data transmission.

When asked if their modems have this feature, many product managers said yes, but added that their versions do not use true adaptive equalization. Many vendors' modems use fixed compromise equalization — a less effective technique used to help reduce signal distortion. Adaptive equalization allows modems on both ends of a line to adjust dynamically

NETWORK WORLD

THE WEEKLY FOR LEADING USERS OF COMMUNICATIONS PRODUCTS & SERVICES

Qualification Form for Free Subscriptions.

Please answer **ALL QUESTIONS,** sign and date the card.

Free subscriptions will be accepted only from individuals in the U.S. and Canada with active professional or managerial responsibilities in communications. The publisher reserves the right to limit the number of free subscriptions accepted in any business category. To qualify, you must answer all the questions below completely, **sign and date this form.**

If address has changed, attach mailing label with old address here.
☐ Address Change ☐ New subscription

First Name | Middle Initial | Last Name

Your Title

Company Name

Div., Dept.

Street Address

City | State | Zip Code

Is the above your home address? ☐ Yes ☐ No

I wish to receive a subscription to *Network World:* ☐ Yes ☐ No

Signature _____

Title _____ Date _____

Business Phone (_____) _____

PLEASE ANSWER ALL QUESTIONS, SIGN AND DATE THE CARD.

1 My primary areas of activity. Circle ONE only.
I am involved in evaluating communications (data, voice and /or image) products and services:
1. for *use within my own* company/organization
2. for *resale* to other companies/organizations
3. Both

1a For communications, my primary responsibility is: Circle ONE only.
1. Data Communications
2. Voice Communications
3. Both

2 Circle only the ONE title classification which most applies to you.

Company Management
11. Chairman, Pres., Owner, Gen. Mgr., Partner, Director, CIO, VP, Dir. Head of Finance, Admin. Procurement

Communications Management

Data Communications
21. Management
VP, Dir., Mgr., Head, Chief: Data Communications, including Networks, Engineering, Design, R&D, Application Development
22. Supervisory/Staff
Supervisor, Head : Networking, Design, Analysis, Engineering, R&D, Applications, Services

Telecommunications
31. Management
VP, Dir., Mgr., Head, Chief: Telecomm., Voice Comm., including Networks. Engineering, Design, R&D, Application Development
32. Supervisory/Staff
Supervisor, Head: Networks, Design, Analysis, Engineering, R&D, Applications Services

Factory Communications
41. Management
42. Supervisory/Staff

MIS/Data Processing
51. Management
VP, Dir., Mgr., Head, Chief: MIS/DP, Systems Application Development, Operations, Office Automation
52. Supervisory/Staff: Supervisor, Head of System Design, Analysis, Applications

Others
75. Consultant
80. Educator
85. Financial Analyst
90. Marketing/Sales
95. Other _____

3 Job Function
Which one of the following best describes your functional involvement with communications (data, voice, and/or video) products? Circle ONE only.

Corporate
1. Business Management, Planning and/or Development

Communications System/Network
2. Management, Planning and/or Development
3. Implementation and/or Operation
4. Other _____

4 Which one of the following best describes the primary business activity of your organization at this location? Circle ONE only.

Consultants
11. DP/Communications Consulting Services
12. Consulting Services (except DP/Communications)

End Users
13. Manufacturer (other than computer/communications)
22. Finance/Banking/Insurance/Real Estate
23. Education
24. Medicine/Law
25. Wholesale/Retail Trade
26. Public Utility/Transportation
27. Mining/Construction/Petroleum Refining/ Agriculture/Forestry
28. Business Services (excluding DP/Communications)
29. Government: Federal
30. Government: State/Local

Vendors
41. Carrier: including AT&T, BOCs, Independent Telcos, Public Data Networks, Intern'l Records Carriers
42. Interconnect
43. Manufacturer Computer/Communications Equipment
44. Value Added Reseller (VAR), Systems House, Systems Integrator
45. Distributor
46. DP/Communications Services (excluding consulting)
95. Other _____

5 In which ways do you typically become involved in acquiring communications products (data, voice, and/or video) and services? Circle ALL that apply.
1. Recommend/Specify
2. Identify/Evaluate Potential Vendors
3. Approve the Acquisition
4. None of the Above

6 Check ALL that apply in columns A and B.
A. I am personally involved in the acquisition process (specification, selection, approval) for the following products and services:
B. These products and services are presently in use at this location:

A	B	*Product/Services*
		Computers
☐	☐	01. Micros
☐	☐	02. Minis
☐	☐	03. Mainframes
		Data Communications
☐	☐	04. Communications Processors
☐	☐	05. Comm./Networks Software
☐	☐	06. Digital Switching Equipment
☐	☐	07. Facsimile
☐	☐	08. Modems
☐	☐	09. Multiplexers
☐	☐	10. Protocol Converters
☐	☐	11. Network Mgmt. & Control
☐	☐	12. Test Equipment
☐	☐	13. 3270 Controllers
		Telecommunications
☐	☐	14. PBXs
☐	☐	15. Key Systems
☐	☐	16. Central Office Equipment
☐	☐	17. Integrated Voice/Data Terminals

A	B	*Product/Services*
		Transmission/Network Services Equipment
☐	☐	18. Microwave
☐	☐	19. Satellite Earth Stations
☐	☐	20. Local Area Networks
☐	☐	21. Wide Area Networks
☐	☐	22. Packet Switching Equipment
☐	☐	23. Fiber Optic Equipment
		Communications Services
☐	☐	24. Packet Switching Services
☐	☐	25. Cellular Mobile Radio Services
☐	☐	26. Electronic Mail
☐	☐	27. Enhanced Services
☐	☐	28. Centrex

7 Estimated value of communications systems, equipment and services:
A. which you helped specify, recommend or approve in *last* 12 months? Check only ONE in column A.
B. which you plan to specify, recommend or approve in *next* 12 months? Check only ONE in column B.

A	B		A	B	
☐	☐	1. Over 10 million	☐	☐	6. $100,000-250,000
☐	☐	2. $5-10 million	☐	☐	7. $50,000-100,000
☐	☐	3. $1-5 million	☐	☐	8. Under 50,000
☐	☐	4. $500,000-1 million	☐	☐	9. Don't know
☐	☐	5. $250,000-500,000			

8 Estimated gross annual revenues for your entire company/institution:
Circle only ONE.
1. Over $1 billion
2. $100 million to $1 billion
3. $5 million to $100 million
4. Under $5 million

9 Estimated number of total employees at this location:
Circle only ONE.
1. Over 5,000
2. 1,000-4,999
3. 500-999
4. 250-499
5. 100-249
6. 50-99
7. 20-49
8. 1-19

3A05-36
NWW1
THANK YOU!

STOP. Did you do the following:

1. Supply old and new address if address has changed
2. Answer all questions
3. Sign and date form

FOLD HERE AND MAIL TODAY

PLACE
POSTAGE
STAMP
HERE

Network World
P.O. BOX 1021
SOUTHEASTERN, PA 19398-9979

PLEASE TAPE HERE

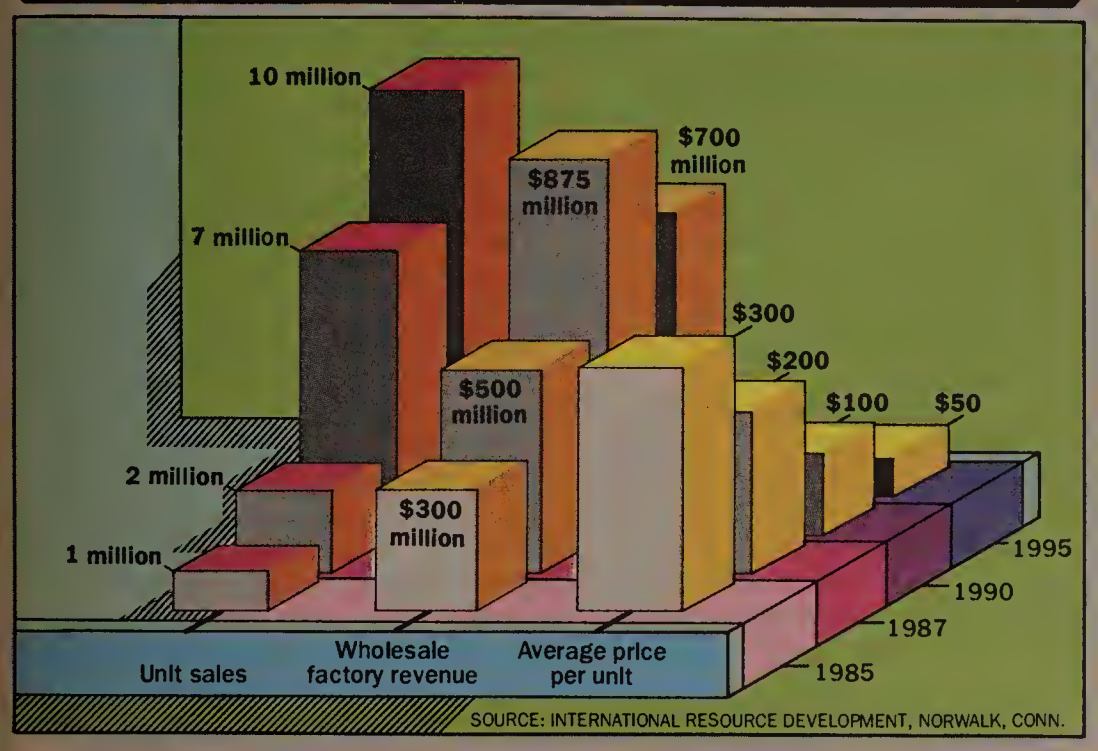
THANK YOU.

Network World

The Weekly For Leading Users of Communications Products & Services

200 bit/sec
n market

1,200 bit/sec full-duplex modem market



to the characteristics of that line.

General Datacomm Industries, Inc.'s Konetski claims his company produces the only 1,200 bit/sec modems that feature true adaptive equalization. Other vendors argue that the quality of dial-up telephone lines is such that adaptive equalization is not necessary. Users should press vendors on this issue, as it is unclear which products have this feature, how effective it is and how the flavors differ.

Corporations use 1,200 bit/sec modems where a small number of users are at geographically dispersed locations and where users do not need time-critical access to computing resources such as minicomputers and mainframe computers.

Low-speed modems are popular in dial-up processing applications and are widely used to access public data base services such as *Reader's Digest*'s The Source, and Dow Jones & Company, Inc.'s News/Retrieval Service.

Error checking

Vendors disagree on the need for error-checking capabilities in 1,200 bit/sec modems. Error-checking protocols are designed to detect and correct errors in transmitted data.

Although Microcom, Inc.'s Microcom Networking Protocol (MNP) and the Tymnet-backed X.PC error-checking schemes are both popular among users of 2,400 bit/sec modems, most vendors of 1,200 bit/sec

Continued on **page 26**

Company	Anderson Jacobson, Inc.	AT&T Information Systems		Case Communications, Inc.		Cermetek Microelectronics, Inc.		General Datacomm, Inc.
Product	1212-AD3H	Model 4000	Model 4112	Executive 212	PC 212	Security Modem	Cermetek 1200 SPC modem	212A/ED +
Standards compatible with:	Bell 103 Bell 212A V.22	Bell 103 Bell 212A	Bell 103 Bell 212A	Bell 103 Bell 212A	Bell 103 Bell 212A	Bell 103 Bell 212A	Bell 103 Bell 212A	Bell 103 Bell 212A
Command sets supported	Hayes AT and AJ command set	Hayes AT	Hayes AT	Hayes AT	Hayes AT	Hayes AT	Hayes AT	Hayes AT
Built-in error correction								
Built-in nonvolatile memory	25 sequences of 43 digits	Information not available	Uses Personal Computer memory	10 sequences of 30 digits	Uses Personal Computer memory	4 sequences of 32 digits	Uses Personal Computer memory	30 sequences of 60 digits
Built-in automatic logon feature	✓	✓	✓	✓	✓	✓	✓	✓
Built-in number linking	✓	✓	✓	✓				✓
Built-in local and remote diags	✓	✓	✓	✓	✓	✓	✓	✓
Adaptive equalization	✓			✓	✓	✓		✓
Synchronous input capability	✓			✓		✓		✓
Carrier-detect disconnect time	.1 sec-25.4 sec (user selectable)	Information not available	Information not available	210 msecs.	210 msecs.	700 msecs.	700 msecs.	350 msecs.
Vendor-supplied software available	*See below	Softcall $75	Softcall (no cost)	Microsoft, Inc. Crosstalk XVI $89			Softklone Distributing, Inc.'s Mirror (no cost)	Acculine $99
List price stand-alone	$499	$499		$499		$495		$499
List price IBM Personal Computer card			$489 (also works w/ AT&T PC 6300)		$499		$495	
List price rack-mounted				$449		$895		

From **page 25**
modems have either implemented less sophisticated error-checking protocols or offer no such capabilities at all.

A few 1,200 bit/sec modem vendors offer MNP or X.PC, but many vendors claim that software bundled with their modems performs rudimentary error-checking.

Dave Wilkes, product planner for Anderson Jacobson, Inc., says there is a need for error checking in 1,200 bit/sec modems. "We are considering implementing an error-checking protocol in the 1212-AD3M," he notes.

Keith Peters, 1,200 bit/sec remote site product manager for Racal-Vadic, Inc., says there has been much demand for error-checking capabilities on the company's 2,400 bit/sec modems. "The average user sending an average file probably won't be too concerned about error checking," he claims. However, Peters says users wishing to send financial data or graphics should consider modems equipped with an error-checking scheme.

Vendors such as Hayes Microcomputer Products, Inc., Novation, Inc. and Racal-Vadic equip their modems with Xmodem, an older and simpler error-correction and file-transfer protocol.

Security on the line

Just as a chain is only as strong as its weakest link, a corporation's computer system is only as secure as its modems. Some vendors of 1,200 bit/sec modems claim security is near the top of users' priority lists when buying high-speed modems, but is often left off their lists when these users purchase modems that operate at 1,200 bit/sec.

Cermetek Microelectronics, Inc., Racal-Vadic, and Anderson Jacobson all offer modems with extensive security features. William Sopp, vice-president of systems marketing and sales at Cermetek, says security is an essential feature of its 1,200 bit/sec modems.

"Many engineering firms use the security features to allow their design engineers to work at home and access the firms' computers," he explains. "The design engineers want to access a particular computer, but they don't want anyone else to be able to access this privileged data."

Terry Prickett, product marketing director for Case Communications, Inc., disagrees with Sopp's view on modem security. "Although we hear more and more about security, we don't think there is a serious demand for it," he says.

Anderson Jacobson's Wilkes sides with Sopp. "For years I have read stories about unauthorized users gaining access to computer systems and doing substantial damage to them," he recalls. "I think it's terribly stupid for companies to leave their computers wide open to unauthorized users."

Wilkes says that his company's 1212-AD3M modem has a password security feature that lets a company's communications manager remotely access the information in the unit's memory. In this way, the communications manager of a Los Angeles-based corporation can reconfigure modems at the company's Dallas, Chicago and New York offices from the company's headquarters.

Cermetek's Security modem offers three levels of security. The modem turns away unauthorized users who have not been assigned a multicharacter user identification number. In the second level of security, the modem scans its memory to determine if there is a callback number associated with the user's identification number.

If no number exists, the modem connects the user to the processing resource. If there is a callback number associated with the user's identification number, the modem instructs the user to terminate the call and await the callback from the modem. Eight to 30 seconds later, the modem calls the user. This level of security turns back users who may accidentally determine an identification number.

The third level of security is designed to prohibit unauthorized users from accessing the modem by chance or through telephone company glitches. The user must insert a key into the modem to view or alter any passwords or callback numbers stored in the modem's memory. "The communications, MIS or DP manager usually holds the key," Sopp notes.

A modem with a built-in number-linking capability will dial a second modem number if the first number dialed is busy. The modem will continue to dial successive modem numbers until a connection is made.

An automatic logon feature eliminates the need for users to enter manually commands that are required to establish a connection with processors. On-line data bases require certain information from a calling modem so the user of the information service can be billed for the call.

Carrier-detect disconnect time is the length of time the modem will hold a line before terminating a connection. Long carrier connect and disconnect times would allow the modem sufficient chance to recognize busy signals or a private branch exchange's call-waiting feature without dropping the carrier. On many 1,200 bit/sec modems, parameters for the carrier-detect disconnect time can be set by the user.

All modems listed in the accompanying chart are compatible with Bell 212A and Bell 103 protocols. Bell 212A is an industry standard protocol, backed by all U.S. modem manufacturers, that supports data transmission at 1,200 bit/sec. Bell 103 supports the transmission of data at 300 bit/sec. A handful of 1,200 bit/sec modems listed on the chart are compatible with CCITT's V.22 standard, which is useful for international communications.

The 1,200 bit/sec, full-duplex market is definitely a buyer's market. Those companies planning to purchase substantial quantities of 1,200 bit/sec modems should keep an eye on this market, as prices of the units will likely plummet quickly. Like the first color televisions, hand-held calculators and now videocassette recorders, 1,200 bit/sec modems will eventually be widely available at bargain basement prices.

Company	Hayes Microcomputer Products, Inc.		Microcom, Inc.		Novation, Inc.	Penril Datacomm Co. (Penril Corp.)	Racal-Vadic, Inc.	
Product	Smartmodem 1200	Smartmodem 1200B	AX 1200	ERA II	Smartcat Plus	Cadet 1200	1200 PA	1200 PC
Standards compatible with:	CCITT V.22 BELL 103 BELL 212A	CCITT V.22 BELL 103 BELL 212A	CCITT V.22 BELL 103 BELL 212A	CCITT V.22 BELL 103 BELL 212A	BELL 103 BELL 212A	BELL 103 BELL 212A	BELL 103 BELL 212A	BELL 103 BELL 212A
Command sets supported	Hayes AT	Hayes AT	Hayes AT and Microcom SX	Hayes AT	Hayes AT	Hayes AT	Hayes AT and Racal-Vadic's auto-dial command set	
Built-in error correction			Microcom Networking Protocol Class 4	Microcom Networking Protocol Class 3			Microcom Networking Protocol Classes 1-3	
Built-in nonvolatile memory	40 characters	40 characters	9 sequences of 36 digits	Uses Personal Computer memory	No memory	40 characters	15 sequences of 60 digits	Uses Personal Computer memory
Built-in automatic logon feature	✓	✓	✓	✓	✓		✓	
Built-in number linking			✓	✓			✓	
Built-in local and remote diagnostics	✓	✓	✓	✓	✓	Local only	✓	✓
Adaptive equalization	✓	✓	✓	✓				
Synchronous input capability			✓	✓			✓	
Carrier-detect disconnect time	.7 sec	.7 sec	User selectable	User selectable	600 msecs	User selectable	User selectable	1 sec
Vendor-supplied software available	Hayes Smartcom II $149	Hayes Smartcom II (no cost)		ERA II (no cost)	Mycroft Labs, Inc.'s Mite $50	VM Personal Computing, Inc.'s Relay $60		George (no cost)
List price stand-alone	$599		$499		$449	$289	$495	
List price IBM Personal Computer card		$549		$499 (includes software)				$295
List price rack-mounted			$479					

This chart presents a selection of vendors in the 1,200 bit/sec modem market. Most vendors produce other modems, and many vendors not included manufacture a full range of competitive products.

* Microstuf, Inc.'s CrossTalk XVI, Communications Research Group's Blast and Software Synergy, Inc.'s Respond.

▶ TELEPHONE SYSTEMS

Fish, fowl or neither?

Quick, what's the difference between a key system and a hybrid?

BY JOHN P. NG
Special to Network World

Customer premises telephone equipment technology has advanced tremendously during the past several years. But while there has been much discussion about large private branch exchange systems and their capabilities, advancements pertaining to smaller systems, particularly key systems, have not received their fair share of attention.

The key system was one of the first telephone systems to be installed on customer premises. By 1990, the value of the total installed base of key systems will reach roughly $7.5 million, according to projections by International Data Corp., a market research firm in Framingham, Mass.

AT&T introduced the first key system, the 1A, in the 1930s. The 1A contained mechanical keys that were used to close an electrical circuit connected to the telephone company central office. Twenty years later, the 1A1 replaced the 1A, but the first major improvements came after another 10 years with the introduction of the 1A2 and its modular, standardized components. The feature-rich 1A2 soon became the standard in telephone equipment. The 1A2 key system is an electromechanical system that consists of a key service unit (KSU), key telephone units (KTU), DC power supply and station equipment. The KSU is the equipment cabinet, usually wall-mounted at the premises' wire closet. KTUs are circuit cards that can be plugged into the KSU to provide access to station lines, central office trunks and various special features such as intercom and music on hold.

Station equipment for the 1A2 is typically comprised of six- and 10-button telephone sets. Each button is used to access an outside line; usually, two buttons are reserved for call holding and intercom. The 1A2 key system can accommodate approximately two to 40 stations and 15 central office trunks. A disadvantage of the 1A2 is that it requires at least 25 pairs of wiring to be pulled to every telephone set. In addition to being bulky, such wiring is expensive to install or rewire for moves or changes.

Toward the latter part of the 1970s, the

Continued on **page 28**

Ng is a consultant in the communications systems engineering division of Network Strategies, Inc. in Fairfax, Va.

From **page 27**
main attraction in the key system market was the development of the electronic key system, which uses microprocessor technology to improve the functionality of the system.

The electronic key system still has a KSU and KTUs like the traditional 1A2 system.

However, most of the mechanical components have been replaced by electronics, and the system is controlled by a centralized processor with built-in software.

Electronic key systems provide more system and station features and can accommodate more stations. A typical system may be made up of between four and 70 stations and can support 30 trunks.

Only two- to four-pair wiring is required to each station, no matter how many outside lines are to be accessed by a station. Installation, moves and changes are easier and less expensive with "skinny" wires.

Electronic key systems usually do not employ standard 500 or 2500 station equipment. (500 sets are common dial pulse phones, and 2500 sets are push-button phones.)

Rather, each system uses its own proprietary phones with software-configured feature buttons and fancy displays. Some stations are also equipped with speakerphones.

Electronic station sets are expensive, however. They cost approximately $200 to $400, compared with standard sets that cost $60 to $80.

Some electronic key systems support the standard 500 and 2500 sets, but vendors always strongly encourage customers to purchase proprietary station equipment to receive all the intended capabilities of the system.

Hybrids in the market

As more capabilities and features were built into their products, some key system vendors began to distinguish their systems from the average key system products.

The result was hybrid systems, or key systems with numerous enhanced capabilities.

Hybrid systems, which became popular around 1980, offer sophisticated PBX features at the price of a key system.

A hybrid system's internals are similar to those of a PBX. Most hybrid systems are stored-program controlled systems with switching matrices designed to have a low blocking probability.

> *"Most hybrid systems are stored-program controlled systems with switching matrices for a low blocking probability."*

Hybrid systems were designed not only to meet external communications needs, but to support communications-intensive internal office environments.

A few hybrid systems are actually fully digital switches (meaning they employ the Pulse Code Modulation technique) with data communications capabilities.

The principal distinguishing characteristic of a hybrid system is its ability to be configured as a PBX.

That is, the call-handling capabilities, system management capabilities and system features of a hybrid are similar to those of a PBX.

Attention Communication Executives:

"What are you

You can have your own FREE

If this issue of Network World doesn't have your name on it, and you're involved in planning or managing data, voice or video communications networks or systems, what are you waiting for?

Fill out the subscription card in this issue. And start receiving your personal copy of Network World. A new, FREE weekly publication written specifically for you.

Take a look through this issue of Network World and see what you can expect each week.

- Information about new products in all areas of data, voice and video communications.
- Updates on new technologies — including those available today, and those that will be coming in the future. Network World tells you what they will mean to your operations, how they will impact your job.
- Reports on how other users are solving their communications problems and how you might take advantage of the lessons learned by others. No need to "reinvent the wheel."
- Coverage of regulatory issues and how they will impact business communications. (Network World's Washington bureau is right on top of everything that's happening, and our editors see it from the user's point of view.)

In addition to offering more features than key systems, hybrid systems can handle more stations and lines. Hybrids are able to accommodate as many as 130 stations and 40 trunks.

In fact, there is an overlap of the hybrid systems market and the small 100-line PBX market.

At this range of line size, it is not apparent whether a PBX or a hybrid system would be more suitable. A PBX would be more expandable and, therefore, would allow for substantial system growth.

A hybrid system, however, would generally be less expensive than a PBX since a hybrid is still classified as a key system.

"Hybrid systems can handle more stations and lines — as many as 130 stations and 40 trunks."

Feature capabilities

The common features of the early 1A2 systems consisted simply of call-hold and intercom. Intercom capability was provided by creating several dedicated talk paths between stations rather than using sophisticated switching matrices to route and establish internal calls.

Later, 1A2 systems boasted more features. AT&T's Comkey system, as an example, offered features such as multiparty conferencing, music on hold, push-button signaling and paging.

Today there are still a significant number of 1A2 key systems being used by businesses.

In fact, more than 50% of the key systems currently in use are 1A2 systems.

This large installed base, however, is shrinking rapidly as 1A2s are replaced by electronic key systems that can offer users more features at comparable prices.

Electronic key systems can provide users with a wide variety of features, probably more than an average user will ever need. The electronic phone set associated with an electronic key system typically contains numerous softkeys that can be programmed to access certain desired features.

Other features can also be accessed by keying in access codes on the push-button pad.

Features that appear in typical electronic key systems, such as AT&T Information Systems, Inc.'s Merlin and TIE/Communications, Inc.'s Paragon, include call forwarding, call waiting, call back, speed dialing and speakerphones.

TIE/Communications and AT&T have been the leaders in sales and installed base in the key system market. Their market shares may begin to erode as other vendors continue to introduce more advanced features, such as an FM wireless intercom or a data communications port.

Identifying hybrid systems

As electronic key systems acquire more and more features and capabilities, it becomes difficult to distinguish between a key system and a hybrid system.

Most vendors, of course, want to claim that their systems are high in functionality, like a hybrid system, but low in cost, like a key system.

One useful way to identify a system as a hybrid is to determine whether or not it

Continued on **page 30**

waiting for ?"

subscription to Network World.

- "Tutorials" that will help you make your communications networks more efficient, or improve your staff's productivity, or get more out of your budget.
- Hard hitting, no-holds barred analysis of trends in communications. Is voice/data integration a Tower of Babel? Is communications technology outstripping our ability to use it effectively? Are we "over-promising" to get bigger communications budgets?

And remember that all of this information is CURRENT because Network World is a WEEKLY publication. Furthermore, Network World is a newspaper format publication, which makes it easy to read, and easy to find what you need. Unlike magazines, that cover a few things in each issue, Network World covers ALL the news every week.

Act now and mail your subscription form today. We will process your application as soon as possible, so you won't miss a single issue of Network World.

If the subscription form is missing from this issue, call **1-800-544-3712** and we will send you one.

A PUBLICATION OF CW COMMUNICATIONS

NETWORK WORLD

From **page 29**
can perform PBX-like functions.

Hybrid systems should provide a full complement of system management and maintenance functions. Such functions include automatic route selection, station message detail recording and direct inward system access.

In addition, a hybrid system should be designed more for internal communications than for external calling.

Hence, its switching matrix — either time-division switching or space-division switching — will have a lower blocking factor.

Among the systems that are considered to be hybrids are TIE/Communications' Ultracom, Thomson-CSF Communications' Opus and Fujitsu Business Communications' Focus Hybrid.

Most hybrid systems can be configured by the user via an RS-232 port connected to a terminal. Some hybrid systems have an automatic line selection feature, which enables a user to pick up the handset and receive the dial tone of an outside line without selecting a line button.

"Hybrid systems should provide such management functions as automatic route selection, station message detail recording and direct inward system access."

Choosing a system

There are three important factors that must be considered when choosing a key or hybrid system:

- required capabilities
- growth and system flexibility
- cost

Because the telephone system market is saturated with numerous systems that offer varying numbers of features and capabilities, it is easy to buy a system that is either too fancy or too basic. Users must first determine what specific telephone capabilities their offices need.

For example, is it necessary to provide all users with programmable electronic sets, or is it sufficient for some users to use simpler, standard 2500 push-button sets?

Many users do not invest enough effort in defining their communications requirements. Writing them down will ensure that they are defined in a concrete form.

Written requirements also will be useful as a set of technical specifications when bids are requested from vendors.

In addition, the office personnel growth rate must be carefully estimated for the subsequent five to seven years, which would be roughly the lifetime of the system.

If the staff is expected to grow dramatically in an office with about 100 stations, then a PBX may be a more suitable option.

On the other hand, it may be better for the same office to consider a hybrid system if growth is not expected to be significant. The ease of upgrading to a larger system must also be carefully evaluated.

Finally, the most important factor is cost. Prices for key and hybrid systems vary according to the capabilities provided and the reputation of the product and the vendor.

"If the staff is expected to grow in an office with about 100 stations, a PBX may be suitable."

It is always a good practice to check out thoroughly several references from users before choosing a system.

System prices

Typically, the price range of a 1A2 system is from $150 to $350 per line. Electronic key systems cost roughly $300 to $600 per line, while hybrid systems are priced from $500 to $800 per line.

PBXs range from as little as $600 to $1,500 per line. At an equivalent price per line, however, a hybrid system typically offers more features and ease of operation than a PBX.

Network World. There's no better place to recruit communications professionals.

The best communications people don't always look through the Sunday classifieds for employment opportunities. But they will read the recruitment pages in *Network World*. Because, unlike the help wanted sections of local newspapers, *Network World's* recruitment advertising targets job openings for communications professionals.

Every week *Network World* reaches over 60,000 communications professionals, including vice presidents, directors, managers, and supervisory staff in the fields of telecommunications, data communications, network management, and network planning and operations. In other words, it reaches the kinds of qualified communications professionals your company wants to recruit.

And, because *Network World's* up-to-the-minute news, features, and editorial are written from a user's point of view, *Network World* gets read. That's why there's no better place to recruit communications professionals.

The next time your company needs to recruit communications professionals, look to *Network World*. You'll get the specialized audience and qualified applicants you want. And, *Network World* ads cost less than ads in national newspapers or ads in major-city newspapers.

Call *Network World's* Classified Department today at (800) 343-6474 and ask for Gina Ciampa. You'll be well on your way to recruiting the industry's top communications professionals.

NETWORK WORLD
The Weekly for Leading Users of Communications Products & Services.

▶ CONTINUED FROM PAGE ONE

What you don't know can hurt you

Staying on top of software copyright laws.

It is vital for users and vendors of networks to have at least a basic understanding of the law. From a legal standpoint, the ultimate goal is to protect your intellectual property rights and avoid violating the rights of others. The best way to avoid the most common pitfalls is through advanced planning.

There are plenty of examples that illustrate the dangers of lax control or incomplete understanding of software laws. For instance, under the work-for-hire provisions of the new Copyright Act, a company could find that it can use the custom communications software it has commissioned, but that the software belongs to its creator, who can also let the company's competitors use it. By failing to take precautions, a company or system creator could lose control of its trade secrets, copyrights and patent rights.

On the other hand, a user's failure to understand the extent of his rights to use a vendor's software could mean legal action for copyright or patent infringement. It could also mean a violation of the vendor's trade-secret rights. An innocent misunderstanding could result in damage claims, injunctions that prevent further use, court-ordered destruction of the infringing software and payment of the intellectual property owner's legal fees.

Silverman is a partner with the Pittsburgh-based law firm of Eckert, Seamans, Cherin & Mellott.

Software copyrighting

The Copyright Act of 1976 clearly provides protection for computer software. The software can be registered with the Federal Copyright Office by providing the office with a visual copy such as a listing of the source code, a completed application and a $10 fee.

Under the first sale doctrine, the purchaser of software becomes the owner of that specific tape or disk, but not of the broader copyright. The owner can resell that specific disk, but does not have the right to reproduce the work.

There are exceptions, though. The Copyright Act allows the buyer to make a copy of the program if a duplicate is essential for the program's use or if it is needed for archival purposes. Many vendors are eliminating copy protection from their software as the burdens on honest customers are being weighed against concerns about illegal copying.

The Copyright Act's Fair Use doctrine permits limited copying based on the qualitative and quantitative amount of the work copied, the purpose of copying, the likely impact on the copyright owner's business and the nature of the software.

Fair Use is a subjective judgement based on careful consideration of these facts. While archival copies are covered under a separate section, they are an example of Fair Use.

Fair Use becomes more difficult to establish when copying is done for commercial purposes. Under the prior Copyright Act, for example, a cigarette company was found guilty of infringement for using a single line from a doctoral thesis in its advertising.

This policy has carried through to the current Copyright Act. For network users engaged in for-profit enterprises, it can also be more difficult to excuse copying on the basis of Fair Use.

Work-for-hire

For firms that have commissioned software to meet their special requirements, the most confusing copyright issue is the question of what constitutes work for hire. Under previous law, when Party A hired Party B to create a new technology, Party A owned all intellectual property rights from anything created under the agreement. Under the current law, a user could hire someone to create software to run its network and end up without ownership of the copyright.

The definition contained in Section 101 of the Copyright Act states that work for hire is work prepared by employees within the scope of their employment, or it is work

Continued on **page 32**

From **page 31**
prepared under an agreement signed by both parties that fits within one of the many specific categories set forth by the act.

The work-for-hire issue is fairly clear-cut regarding full- and part-time employees, but becomes muddied when an independent contractor is hired. The difference between part-time employees and independent contractors depends, in part, on the degree of supervision and control the employer exercises over work performance.

Too often, a company hires a consultant to create software under the assumption that the software will be owned by the company. But it is discovered too late that a carefully drafted agreement prepared and signed before the work begins is the safest guarantee possible.

While the work-for-hire clause should be used in contractual agreements anytime the work can be considered work for hire, placing sole reliance on this clause can be dangerous when the issue is not clear. Many agreements state that work performed shall be considered work for hire under provisions of the Copyright Act of 1976. But the work might not fall within the act's definition of work for hire. Because a contract cannot supercede a federal statute, adding this clause will not convert a relationship that is not work for hire into one that is.

For businesses that commission software — particularly software that gives them a competitive advantage — a much wiser course of action is to include a clause in the contract that expressly assigns to the hiring party all rights, title and interest in any intellectual property created. In cases where work-for-hire provisions do not apply, this gives the hiring party a legal and binding transfer of rights, which then makes the hiring company the owner.

Patents

Patents give the owner the right to prevent others from making, using or selling a patented invention. Unlike copyright laws, it is not necessary to prove copying in order to prove a violation of the law.

Prior to 1981, there was a great deal of uncertainty concerning the ability to patent software. In 1981, the United States Supreme Court ruled that an invention in which software is the crucial component may still be considered for patent. Because of the cost and length of the patent process, and the relatively short life span of some software products, developers must carefully evaluate any decision to obtain a software patent.

Trade secrets

Trade secrets, which are governed by state laws, give a company the right to prevent others from misappropriating practices and technology that are essential to performing that company's business. However, trade secrets do not protect against independent creation. A third party can develop an identical technology and use it however he wishes.

One of the primary problems with trade secrets is maintaining secrecy. The more people come in contact with the technology, the greater the chance that the technology will be compromised.

Protection of computer technology through trade secret statutes is most appropriate when the software is part of a limited-use, mainframe-type technology. It can be covered through an agreement that calls for limited dissemination and carefully controlled use of the technology. In contrast, mass-market, over-the-counter software is usually protected by copyright.

Next week, the conclusion of this two-part series will discuss software site licensing, implied licenses and how users can best protect their rights, while minimizing the risk of infringing on others' rights.

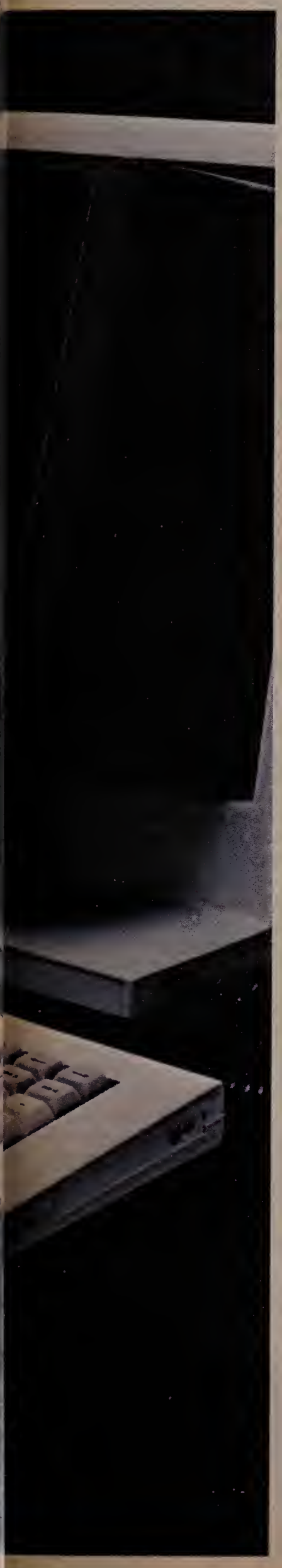
Pro from **page 23**
decision that should be made about deregulation of intrastate toll service or local exchange telephone service. It is whether to operate any part of the telephone service under open competition. Once this decision is made, all segments of the market should be treated consistently.

Some people argue that if telephone service is deregulated before there are alternative suppliers, existing suppliers could charge unreasonably high prices for a temporary period. This fear is unfounded. First, the well-recognized definition of competition is a market where there are actual or potential competitive suppliers. With open-entry competition existing, the single supplier must price reasonably or risk entry by strong competitors. Open-entry and potential competition act as strong forces to keep existing suppliers providing good service at reasonable prices. Consumers enjoy effective protection through the legal system. Antitrust laws penalize suppliers that monopolize a market or engage in unlawful conduct.

"Several procedures would ensure reasonable prices."

In addition, several procedures would ensure reasonable prices during the transition to a fully competitive market. These methods relate to price stability for the service during the transition period. For example, regulators could include maximum price levels, price increases or relationship rates. Such rate-stability procedures were successfully used when embedded customer premises equipment was deregulated.

Customers should insist that foolish regulatory procedures be discontinued for all telephone service. They should require regulators to return to the consumer the power to approve telephone services, prices and suppliers. Only if deregulated toll service and local exchange service has been attempted in today's market, and it has been proven not to work, should the government intervene.



Souped-up Centrex.

Hot new performance from AT&T.

Spread the word: the 1986 model Centrex from AT&T Network Systems is loaded. Now your telephone company can offer you advanced equipment options. New data communications and office automation capabilities. More customer control of features and station numbers than ever.

In all, 15 major improvements! Plus AT&T can help your telephone company customize a Centrex system to meet your special needs.

The 1986 model Centrex. Another product on the road to Universal Information Services: helping your telephone company give you any kind of voice, data or image service, conveniently and economically, over the public telephone network.

That's what makes AT&T "The right choice."

Featured Options

- **Customer Station Rearrangements.** Lets you change features and numbers for each telephone, saving time and money.
- **Customer Message Center.** Centralizes call answering within a business location.
- **Integrated Voice/Data Transmission.** Simultaneous voice/data transmission at up to 19.2 Kb/s, eliminating modems and separate data lines.
- **Advanced Station Message Detail Recording.** Instant access to reports on dates, times and lengths of calls made within your business location.
- **City-Wide Centrex.** Gives multi-location customers the benefits of being on a single Centrex system.
- **Facilities Management.** Allows automatic changes of Electronic Tandem Switching features from one terminal.
- **General Processing.** Office automation using the AT&T 3B computer and user-friendly management software packages.
- **Network Terminals.** New station sets with one-button access to Centrex features and programmable memories.

© 1986 AT&T Technologies, Inc.

AT&T
The right choice.

Con from **page 23**
in Nebraska. On the contrary, rates have gone up twice since deregulation, even with five interexchange carriers competing.

Although the benefits said to spring from competitors playing on a level field are desirable, it is questionable whether most subscribers would favor unbridled competition at the local exchange level, since it would surely mean paying toll charges for all calls, even for those to a next-door neighbor.

In the wake of the divestiture of AT&T, the communications industry is in a state of flux and turmoil. The industry maintains that the breakup, combined with the advent of competition and the decline of regulation, will ultimately save the consumer money while spawning enhanced services. This may come to pass, but during this uncertain and difficult transition period, while true competition at the local exchange level is nonexistent and monopolies flourish, regulation must continue. Only when competition begins to evolve can a phasing out of regulation commence.

Universal service must not be lost in a rush for deregulation and competition. Permitting services to be priced at actual cost while discontinuing cost averaging will surely result in prohibitively high rates in sparsely populated rural areas, causing extensive network drop-off. When this cycle begins as a result of increasing basic service rates, we all lose.

Letters:

"The perils of Paradyne," by Jeffrey Rothfeder (*Network World*, April 28) was misleading because research was insufficient and Paradyne Corp. was not given a chance to tell its story.

Paradyne is a viable company, making a profit in the first quarter of 1986. Although the electronics industry experienced a slowdown that lowered earnings in 1985, Paradyne's financial health continues to be sound, as represented by its strong balance sheet, its positive cash flow in 1985 and its improved working capital.

Paradyne and several of its current and former employees were recently indicted by a federal grand jury, which charged that five years ago the Social Security Administration (SSA) had been misled about the developmental status of intelligent terminal equipment that Paradyne successfully bid for delivery to the SSA.

Paradyne regards the charges as outrageous and so lacking foundation as to be ludicrous. Paradyne will vigorously defend itself and expects to be exonerated. Contrary to implications in the *Network World* article, the SSA has publicly stated that Paradyne's equipment satisfies the requirements of the proposal. As testimony to the quality of Paradyne's products, the suspension of federal government contracts has been waived for several federal agencies so that they can make purchases from Paradyne.

Jerry T. Kendall
executive vice-president
chief operating officer
Paradyne Corp.

Editor's note: Paradyne Corp.'s situation was discussed in an opinion column by Jeffrey Rothfeder, a free-lance writer. Rothfeder spoke with two Paradyne representatives and was given Paradyne's official statements about the indictment. In addition, he reviewed the media coverage of Paradyne, spoke with representatives of the Social Security Administration and discussed Paradyne's situation with several prominent telecommunications industry consultants.

I must stand slightly to the pro side of the issue of certification of communications professionals after reading the two arguments presented ("Should voice/data pros be certified?," *Network World*, April 7) for the following reasons:

- The pro argument raises a valid point in that education, particularly in a field as dynamic as telecommunications, can never stop. Certification and recertification seem to be far preferable to a one-shot qualification.
- I find the con argument lacking any logic that shows the superiority or, for that matter, even the acceptability of passage of a school curriculum over certification. The entire discourse is devoted to slamming at the opposition, the typical presentation of someone who knows their position is weak. At the very least, if the educators were convinced of the quality of their product, they wouldn't be afraid to submit their output to independent verification.
- There exists not one single education establishment-provided telecommunications management program to be delivered to isolated professionals working in the field. There are off-campus programs, but these are limited in delivery to groups within establishments, and rather few groups at that.
- The lack of educational programs for professionals already in the field indicates weak curricula and staffs. The schools don't know what the criteria and learning objectives are.
- Some students have been taught obsolete material. The leading reason is that educators have run to the establishment they knew, that is, [the Bell System], and filled their programs with predereguläation stuff, which is full of presently irrelevant stuff.

I recommend independent certification, divided into specialities as needed, with continuing learning and recertification required.

Donald E. Kimberlin
telecommunications consultant
Mordon Services
Safety Harbor, Fla.

As an individual involved on both sides of the fence as to whether voice/data pros should be certified, I read with great interest your opinion section on the subject ("Should voice/data pros be certified?" *Network World*, April 7).

First off, I think it should have been brought out more clearly that the American Institute has a vested interest in promoting certification because they offer classes on various data communications subjects. In line with these classes, they offer a form of their own certification, which, in reality, is just a series of classes an individual might want to take to cover a particular area of expertise. No recognized group in the industry has established a set of criteria that could be construed as being applicable to any level of certification.

In the world of data communications, the technology is changing so fast that the method for providing some kind of baseline reference for competence, or certification, is most likely obsolete within months.

Not only is the technical world changing, but so are the business and management aspects. This adds a new dimension to the required qualifications of individuals hired as employees or consultants.

Another important point is that the experience and capability of the instructors who teach classes in data communications also reflect upon whether an individual pursues education or certification. Over the past 10 years that I have been teaching data communications, in a career that encompasses almost 30 years of directly related experience, I have seen experienced and well-educated people not able to present classes effectively, and more often, slick instructors who knew all the buzzwords, but couldn't answer students' questions because their knowledge was only a veneer. This, in turn, leads to an even more important question: Who will certify the instructors who teach the classes leading to individual certification?

Since the instructors are not certified themselves, you need to see how long the company has been in business, how long the instructor has been teaching, and you need to ask for references. As the author of a best-selling text on the subject, I still strongly recommend that if you need a particular expertise, such as voice/data, you should not rely on a questionable level of prior knowledge, which could be months or years old.

Dr. Kenneth Sherman
Infocomm, Inc.
Villa Park, Calif.

I look forward to receiving my weekly issue of *Network World* and reviewing the editorial content that has so appropriately filled the gap in today's telecommunications coverage.

The articles and the manner in which they are presented exemplify *Network World*'s exclusive ability to respond and address issues of concern in today's corporate world. As most publications rehash the same issues with a similar market format, *Network World* offers a fresh viewpoint on topics both new and old.

Your selections are truly interesting and informative, and my colleagues and I eagerly look forward to reading all of them. The areas you've hit upon to date, such as several stories on LU 6.2, and "Resume heroes: paper tigers" are things that we deal with daily. Please keep up the great work and continue to keep us informed on the newest technologies.

Edward D. Bowden
network operations manager
Advanced Micro Devices, Inc.
Sunnyvale, Calif.

Fiberway from **page 2**

the same throughput because it eliminates packet collisions typical of any Ethernet implementation.

Devices with Ethernet interfaces, such as Sun Microsystems, Inc.'s CAD/CAM workstations, can be attached directly to an EXL50 interface unit. The EXL50 buffers packets and uses a token-passing method to distribute the data.

To achieve greater throughput for high-capacity applications such as CAD/CAM, the EXL50 can be connected directly to a 25M bit/sec band within the fiber backbone. Although more than twice the operating speed of 10M bit/sec Ethernets, Fiberway results in a tenfold throughput increase because collisions are eliminated, Witkowicz said. Dedicating two bands to the application will double that throughput.

Terminals and other types of 3270 and RS-232 equipment are supported with 2.7M bit/sec circuit-switched links. IBM 3274 display controllers located anywhere on the network can support the usual complement of 32 terminals, which are attached to Ring Interface Units elsewhere on the network. The display stations are polled on the ring using a Fiberway network address.

When used to support typical asynchronous RS-232 equipment, the Node Concentrators and Ring Interface Units can provide local switching. A device attached to a Ring Interface Unit can access any of the seven other ports on the same unit or, through the Node Concentrator, up to 56 other Ring Interface Unit ports, without ever getting on the fiber backbone.

Local switching is made possible by the intelligence provided by Motorola, Inc. 68000 microprocessors in both pieces of hardware. A dedicated network control channel shared by all Node Concentrators and Ring Interface Units enables a single network management system to control all aspects of the broadband network, Witkowicz said.

An IBM Personal Computer XT or Personal Computer AT outfitted with Artel software can be used to manage status summary — which shows information about net performance and lost packets — net configuration and diagnostics.

Witkowicz estimates the cost of Fiberway to be between $200 and $500 per port. He claims Fiberway is 30% less expensive than a comparably configured AT&T Information Systems, Inc. Information Systems Network.

Fiberway will be available in July.

Correction:

In the June 2 issue of *Network World*, we reported that users could obtain a copy of the "1986 Salary Survey, Information Management/Data Processing Executive Positions" from Edward Perlin Associates. While Edward Perlin Associates welcomes questions about the survey, the report is only made available to the companies who underwrote the survey. *Network World* regrets the error.

Network World.
"... it's targeted to the people who count — our customers and prospects."

David Hunter, Director of Communications, Avant-Garde Computing, Inc.

Because Networks
Must Be Managed

AVANT-GARDE

Avant-Garde Computing, Inc.
8000 Commerce Parkway
Mt Laurel NJ 08054-2227

TWX 710-940-1569
Telephone 609-778-7000

May 23, 1986

F. Douglas DeCarlo
Publisher
Network World
CW Communications/Inc.
PO Box 9171
Framingham MA 01701-9171

Dear Doug:

A short story I thought you would like to hear:

An advertising rep for one of the more established trade journals nabbed me at a recent trade show and demanded to know why we had decided to advertise in Network World.

"It's unproven," he said. "It's redundant," he said. "It's risky," he said.

"Perhaps," I replied. "But it's also informed. Pithy. Timely. Attractive. And more importantly, it's targeted to the people who count -- our customers and prospects. We're going to give it a go."

"See you," he said.

"Yes," I replied. "In Network World."

David Hunter
Director of Communications

Network World Sales Representatives

BOSTON	WASHINGTON, DC	ATLANTA	NEW YORK	SAN FRANCISCO	LOS ANGELES	CHICAGO
Maureen Sebastian	Gordon DuChez	Tom Tolbert	Eleanor Angone	Chris Clyne	David Beardslee	Fran Jonikaitis
(617) 879-0700	(301) 921-9085	(404) 394-0758	Joseph Viviani	(415) 328-4602	(714) 545-7278	(312) 827-4433
			(201) 967-1350			

NETWORK WORLD

The Weekly for Leading Users of Communications Products & Services

A PUBLICATION OF CW COMMUNICATIONS

375 Cochituate Road, Box 9171, Framingham, MA 01701-9171.

Calendar

June 18-19, New York — Essentials of Network Management. Contact: Avant-Garde Computing, Inc., 8000 Commerce Pkwy., Mt. Laurel, N.J. 08054.

June 19-20, Austin, Texas — Southwest Computer Measurement Group Summer Meeting. Contact: Ellen Robertson, Texas Utilities Services, Inc., 2001 Bryan Tower, Dallas, Texas 75201.

June 19-20, Las Vegas, Nev. — Gartner Group's Fourth Annual IBM Futures Conference. Contact: Ashley Pearce, Gartner Group, Inc., P.O. Box 10212, Stamford, Conn. 06904.

June 23-27, Cambridge, Mass. — Managerial Planning for the Security and Privacy of Contemporary Computer and Telecommunications Systems. Contact: Massachusetts Institute of Technology, 77 Massachusetts Ave., Room 7-338, Cambridge, Mass. 02139.

June 25-26, Hartford, Conn. — Fiber Optics in Plain English. Contact: R. Skinner, Clifford, Inc., P.O. Box 51, Bethel, Vt. 05032.

June 25-27, San Francisco — Nata West. Contact: North American Telecommunications Association, 2000 M St. N.W., Suite 550, Washington, D.C. 20036.

June 30-July 1, Crystal Lake, Va. — The Postdivestiture Tariffs and Their Impact on Large Networks. Contact: The Aries Group, Inc., 1500 Research Blvd., Suite 320, Rockville, Md. 20850.

July 9-11, New York — Fourth Annual PC Expo. Contact: PC Expo, 333 Sylvan Ave., Englewood Cliffs, N.J. 07632.

July 10-11, Chicago — Networking the IBM PC. Also, July 14-15, Orlando, Fla.; July 24-25, Morristown, N.J.; July 28-29, Boston; Aug. 4-5, Kansas City, Mo.; Aug. 11-12, Minneapolis. Contact: The American Institute, Carnegie Building, 55 Main St., Madison, N.J. 07940.

July 14-15, Cambridge, Mass. — Negotiating the Best Deals on Telecommunications Products. Also, July 17-18, New York. Contact: Joan Merrick, Boston University Seminar Coordination Office, 850 Boylston St., Suite 415, Chestnut Hill, Mass. 02167.

July 14-16, Chicago — Fiber-Optic Communications. Also, Aug. 6-8, New York; Sept. 15-17, San Francisco; Oct. 20-22, Boston; Nov. 3-5, Chicago. Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521-2939.

July 14-16, Arlington, Va. — NET/Comm Security '86. Contact: Conference Registrar, Computer Security Institute, 360 Church St., Northborough, Mass. 01532.

July 15-16, New York — Intercompany Networks: EDI and Beyond. Contact: The Yankee Group, 89 Broad St., Boston, Mass. 02110.

Aug. 4-6, Dallas — Computers, Technology and Learning. Contact: Nancy Melton, Infomart, 1950 Stemmons Freeway, Administrative Offices, Suite 6038, Dallas, Texas 75207.

Aug. 21, Dallas — Industry Update: MIS. Contact: Nancy Melton, Infomart, 1950 Stemmons Freeway, Administrative Offices, Suite 6038, Dallas, Texas 75207.

Call for authors

Network World is currently seeking feature articles on the following topics: bypass, micro-to-mini-to-mainframe connections, network design and videotex.

Send proposals for management-oriented articles on these and other timely communications topics to Steve Moore, features editor, *Network World*, Box 9171, 375 Cochituate Road, Framingham, Mass. 01701.

Advertisers Index

	Page
Anderson-Jacobson	16
AT&T Information Systems	32-33
AT&T Technology	5
Carterphone	39
Connections	10
DEC	40
Litel Telecommunications	7

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

Network World Sales Offices

Robert P. Pavone
National Sales Director

Pam Valentinas
Manager/Marketing & Sales Operations

Karen Wallace
Account Coordinator
375 Cochituate Road.
P.O. Box 9171
Framingham, MA 01701-9171
(617) 879-0700

BOSTON
Maureen Sebastian
375 Cochituate Road.
P.O. Box 9171
Framingham, MA 01701-9171
(617) 879-0700

NEW YORK
Eleanor Angone
Joseph Viviani
Paramus Plaza I
140 Route 17 North
Paramus, NJ 07652
(201) 967-1350

WASHINGTON, D.C.
Gordon DuChez
20608 Beaver Ridge Road
Gaithersburg, MD 20879
(301) 921-9085

SAN FRANCISCO
Chris Clyne
1060 Marsh Road, Suite C-200
Menlo Park, CA 94025
(415) 328-4602

ATLANTA
Tom Tolbert
1400 Lake Hearn Drive, Suite 330
Atlanta, GA 30319
(404) 394-0758

CHICAGO
Fran Jonikaitis
2600 South River Road, Suite 304
Des Plaines, IL 60018
(312) 827-4433

LOS ANGELES
David Beardslee
18004 Sky Park Circle, Suite 100
Irvine, CA 92714
(714) 545-7278

CLASSIFIED ADVERTISING
Gina Ciampa
375 Cochituate Rd.
Framingham, MA 01701-9171
(617) 879-0700

Network World is a member of the CW Communications/Inc. group, the world's largest publisher of computer-related information. The group publishes over 50 computer publications in more than 20 major countries. Nine million people read one or more of the group's publications each month. Members of CWCI group contribute to the *Computerworld* News Service, a daily on-line service offering the latest on domestic and international computer news. Members of the group include: ARGENTINA'S *Computerworld/Argentina;* ASIA'S *Asian Computerworld;* AUSTRALIA'S *Computerworld Australia, Australian PC World* and *Macworld;* BRAZIL'S *DataNews,* and *PC Mundo;* CHINA'S *China Computerworld* and *China Computerworld Monthly;* DENMARK'S *Computerworld/Danmark, PC World* and *Run (Commodore);* FINLAND'S *Mikro;* FRANCE'S *Le Monde Informatique, Golden (Apple), OPC (IBM), Theoreme* and *Distributique;* GERMANY'S *Computerwoche, Infowelt, PC Welt, Computer Business,* and *Run;* ITALY'S *Computerworld Italia* and *PC Magazine;* JAPAN'S *Computerworld Japan;* MEXICO'S *Computerworld/Mexico;* THE NETHERLAND'S *Computerworld Netherlands* and *PC World;* NORWAY'S *Computerworld Norge* and *PC Mikrodata;* SPAIN'S *Computerworld Espana, PC World* and *Commodore World;* SWEDEN'S *ComputerSweden, Mikrodatorn,* and *Svenska PC World;* SWITZERLAND'S *Computerworld Schweiz;* THE UNITED KINGDOM'S *Computer News, PC Business World,* and *Computer Business;* VENEZUELA'S *Computerworld Venezuela;* the U.S. *Amiga World, Computerworld, inCider, Infoworld, MacWorld, Micro Marketworld, PC World, Run, 73 Magazine, 80 Micro, Focus Publications* and *Network World.*

CAREER ANNOUNCEMENTS

This is a sampling of our Classified Advertising section. For more information on Classified Advertising please fill-in and return the form below or contact Network World, Advertising Department at CW Communications, Inc., 1-800-343-6474 or in Massachusetts (617) 879-0700.

Telecommunications Technical Analyst - Senior

Qualifications: Bachelor's D... of five years experience in voice communicat... have been in the systems planning, sys... procurement and implementation in large PABX or ... support environments.

3 Columns x 3 Inches

This is a sampl... our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section.

DATA COMMUNICATIONS MANAGER

If you are an aggressive self... rter who enjoys challenge, we ma... he position for you.

2 Columns x 4 Inches

At least three... al involvement with ... communications supp... ooting is needed.

This is ...ing of our classified advertising s...ion. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section.

MANAGER CORPO... INFOR...

Position is ... developing ar... external inforar... that focus on t... ents.

1 Column x 2 Inches

T... of our classified pl... tion. This is a sample classified advertising sect...

DIRECTOR NETWOR... PLANN...

The qualified car... undergraduate ...g with gradua... preferred. A ... anagement in ... switching and ... strong background ... ning.

1 Column x 2 Inches

... our classified advertising ... This is a sampling of o... dvertising section. This is a ... of our classified advertising s... This is a sampling of our classified advertising section.

Manager, Technology Projects - Networks

Seeking experienced manager. The successful candidate will manage a staff of 15 technical professionals as well as provide overall direction on the telecommunications activities associated with our technology center.

You should have 5 ... years experience in telecomm... s networking, including ... e and data. Strong proje... gement abilities and prover... al skills.

2 Columns x 6

This is ... of our classified advertising ... n. This is a sampling of our classifi... advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section.

TELECOMMUNICATIONS MANAGER

Responsible for engineering analysis of telephone utilities and issues. Requires engineering degree and two years of experience.

Responsible for engineering analysis of telephone utilities and issues. R... uires engineering degree and two years ... erience.

Responsible for engi... sis of telephone utilities and ... engineering degree and ... erience.

2 Columns x 5 1/2

This is a s... ssified advertising section. Th... of our classified advertising sec... is a sampling of our classified adve... g section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section. This is a sampling of our classified advertising section.

CLASSIFIED ADVERTISING

Information Form

Name_____

Title_____

Company_____

Address_____

_____

Telephone No._____

☐ Please send me more information on Classified Advertising.

☐ Please have someone call me with information.

Return to: **NETWORK WORLD**
Classified Advertising
375 Cochituate Road
Framingham, MA 01701

▶ PRODUCT REVIEW

Trimmed-down tools test well

Timeplex and Tellabs offer T-1 alternatives for users with modest needs.

BY JOHN J. HUNTER
Contributing Writer

If you've been staying away from T-1 transmissions because of the cost of service and T-1 multiplexers, read on. Things are getting better — at least as far as multiplexer prices are concerned.

Until recently, the T-1 multiplexer — like T-1 transmission service — has been a tool for the large-scale user. T-1 service provides a bandwidth of 1.544M bit/sec that can be used to transmit digitized voice and data. T-1 multiplexers exist solely to optimize the use of available bandwidth by combining multiple inputs over T-1 lines.

Both T-1 service and the multiplexers that serve them are anything but cheap. T-1 multiplexers run from $20,000 to more than $100,000 per end.

Recently, a few multiplexer vendors have introduced stripped-down, low-cost versions of their more powerful products. These multiplexers provide basic point-to-point transmission facilities and support only a limited number of voice and data channels. Typical prices for entry-level versions of these new multiplexers are well under $10,000 per end.

Two companies that have recently introduced such multiplexers are Timeplex, Inc. and Tellabs, Inc. The new Timeplex Minilink/1 uses the same voice and data cards as its Timeplex Link/1 product. The Tellabs 420 T-Plexer, which was introduced in January, offers facilities that are far superior to the larger 430 T-Plexer.

For example, the synchronous channel of the 420 handles data rates from 300 bit/sec to 1.536M bit/sec, vs. 1,200 bit/sec to 768K bit/sec for the 430. In addition, the 420 has improved central logic, which reduces system overhead and provides a usable bandwidth of 1.536M bit/sec, vs. 1.318M bit/sec for the 430. According to Tellabs, the 430 will soon be upgraded to provide the same facilities as the newer unit. (Both the 420 T-Plexer and 430 T-Plexer are also sold by AT&T Information Systems under the names Dataphone II 724 and 735 T-Multiplexer.)

Since the early 1960s, AT&T has used T-1 internally to transmit digitized voice between service offices. Voice digitizing is accomplished by using Pulse Code Modulation (PCM). PCM converts the analog voice input into a 64K bit/sec digital representation and assigns it to a channel position within the T-1 composite. Each T-1 link contains 24 channels, called DSO channels, and transmits at 1.544M bit/sec. Subscribers may employ the entire 1.544M bit/sec bandwidth to carry voice, data or a combination of the two. AT&T Communications, Inc. now markets its family of T-1 transmission services under the name Accunet.

The basic Accunet T1.5 service is designed for point-to-point applications, with transmission terminating at a single user site. The actual transmission of data takes place over AT&T Communications' facilities. AT&T also offers an enhanced T-1 transmission facility called Digital Access and Crossconnect System (Dacs), which lets users designate individual DSO channels to be routed to different network locations. Switching is handled by a Dacs controller, which accepts individual T-1 links originating from customer locations. Any T-1 multiplexer that interfaces with a Dacs controller has a competitive edge. However, neither of these multiplexers is fully Dacs-compatible.

The features of the Timeplex Minilink/1 and Tellabs 420 are shown in Table 1. Both are bit-interleaved, time-division multiplexers that are configured and controlled from an Ascii terminal. Both are also strictly point-to-point systems, although the Timeplex multiplexer also supports bypass applications. The Minilink/1 can be configured with up to two independent T-1 links, while the 420 handles only one. Both products meet the D4 message framing requirements needed for attachment to Accunet's T1.5 service.

The data-handling facilities of the products are about equal, although the 420's 1.536M bit/sec rate gives it an edge in accommodating applications such as high-speed file transfers, graphics and digitized video. The Timeplex unit, however, offers a wider variety of channel cards. For example, users are offered a dual (two-channel) or quad (four-channel) synchronous data module; a quad-channel asynchronous module; and a dual-channel asynchronous data module. (All are right out of the Link/1 parts list.) The quad synchronous module supports a data range of 50 bit/sec to 256K bit/sec. All ports can be programmed individually and can operate simultaneously at speeds to 128K bit/sec.

The dual-port synchronous module also allows each port to be individually programmed and supports a data range from 192K bit/sec to 1.152M bit/sec per port. The latter speed is a recent enhancement, since the original dual-port board only had a top rate of 768K bit/sec. The asynchronous channel module, also a quad board, has a top data rate of 19.2K bit/sec.

Applications such as mainframe file transfers and digital video are much more efficient at high speeds. For that reason, a number of vendors, such as Datatel, Inc., Infotron Systems Corp. and Digital Communicatons Associates, Inc., are now offering channel cards with 1.536M bit/sec data rates. Timeplex would do well to do the same.

Tellabs only offers a quad synchronous channel module, with each port programmable at speeds to 1.536M bit/sec. However, one drawback is that Tellabs does not offer an asynchronous channel.

Like other T-1 vendors, Tellabs inconveniently requires users to interface asynchronous inputs via external multiplexers or by oversampling a synchronous channel.

For example, an external multiplexer not only adds additional cost to the system, it provides a point of failure that affects multiple terminals attached to the multiplexer. The oversampling trick allows a synchronous channel to service an asynchronous input by clocking the data in at four times the actual data rate. But this wastes bandwidth, since a good portion of the channel's output contains no data. According to Tellabs, an asynchronous data channel should be released soon.

Timeplex and Tellabs have done a good job with voice facilities. Both support the industry standard PCM digitizing technique. Both have also implemented the Adaptive Differential Pulse Code Modulation (ADPCM) scheme, also employed by AT&T. ADPCM digitizes voice at a rate of 32K bit/sec, vs. 64K bit/sec for PCM. Thus, two voice channels can be placed in each DSO channel, effectively doubling the multiplexer's voice-carrying capacity.

Timeplex has also implemented the Continuously Variable Slope Delta (CVSD) digitizing scheme. With CVSD, voice can be digitized in multiples of 8K bit/sec to make more effective use of the DSO channel. CVSD-encoded data, however, cannot be used with AT&T carrier facilities. We haven't heard Timeplex's version of CVSD, but our experience with other vendor renditions of CVSD has shown voice to be a little raspy at 16K bit/sec.

The Timeplex unit is available with up to 44 ports, while the Tellabs 420 can have up to 40 ports. Beyond that, both vendors require moving up to larger units. As for flexibility, the Minilink/1 can be fitted with two independent T-1 links, vs. only one for the 420.

Which product is superior depends on the application. If the multiplexer is used primarily to handle voice, and transmission will be over a private network, then the CVSD channels offered by Timeplex will provide twice the capacity of ADPCM.

If the multiplexer is used to handle mainframe-to-mainframe file transfers, high-speed graphics or digitized video, then the high data speeds supported by Tellabs is an advantage. If the multiplexer is not used for these kinds of applications, then the product offering the greatest channel-handling capacity has the edge. Here, Timeplex gets the nod.

Many organizations want the ability to communicate with multiple remote offices. In this situation, a product supporting more than one high-speed link is extremely valuable, since it obviates the need for additional multiplexers. Here the dual independent links of the Timeplex Minilink/1 make it the better choice.

Pricing these multiplexers is tricky, since Timeplex sells its products by two- and four-port I/O modules. A Minilink/1 with two I/O modules costs $9,000; a 420 T-Plexer with a single I/O module (four I/O ports) sells for $6,825; a 420 with two I/O modules (eight I/O ports) sells for $8,325. A Minilink/1 with a four I/O modules (up to 16 ports) lists for $12,500, vs. $11,325 for the Tellabs unit.

Those prices are attractive, but contact your local telephone company before calling your multiplexer vendor. The price of the T-1 service might floor you. Last year, any user with 10 to 12 voice-grade lines could justify moving to T-1. Now, according to figures released by the Stamford, Conn.-based Gartner Group, the telephone companies have raised the price of T-1 service to a level where the break-even point occurs between 10 and 20 voice-grade lines. That locks out a lot of potential users regardless of the multiplexer price. So much for progress.

John Hunter is president of TMS Corp. in Devon, Pa.

Timeplex Minilink/1 and Tellabs 420 T-Plexer specifications

Vendor/Product		
Timplex, Inc./ Minilink/	Tellabs, Inc./420 T-Plexer	
44	40	Number of channels supported
✓	✓	Synchronous channel card
✓		Asynchronous channel card
1.152M	1.536M	Maximum synchronous data rate (bit/sec)
19.2K	19.2K	Maximum asynchronous data rate (bit/sec)
✓	✓	PCM voice card
✓	✓	ADPCM voice card
✓		CVSD voice card
✓	✓	Single T-1 link
✓		Dual T-1 link
✓	✓	D4 message framing
optional	optional	Redundant control logic and power supplies

PCM = Pulse Code Modulation
ADPCM = Adaptive Differential Pulse Code Modulation
CVSD = Continuously Variable Slope Delta

SOURCE: JOHN HUNTER ASSOCIATES, DEVON, PA.

CARTERFONE'S VERY HIGH SPEED ASYNCHRONOUS DIAL-UP MODEMS

19.2 Kbps

At first glance the best very high speed modems appear to have the same features:

Up to 19.2 Kbps Dial-Up
Error Protection
Data Compaction
Character Compression
Sophisticated Diagnostics
Hayes Commands
Bell Compatibilities
Rack Mounting
Cost Saving
Fall Back Modes

Call for application assistance in selecting the right modem for your particular requirement:

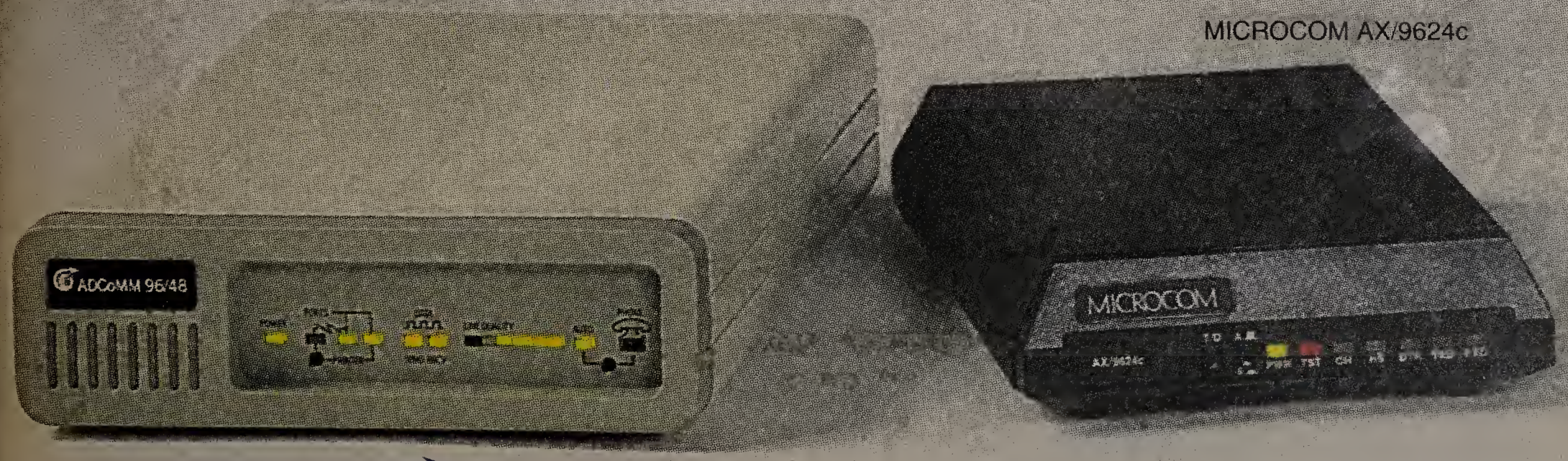
APPLICATION CONSIDERATIONS

Cost of Ownership
Interactive Response Time — ECHO
Local or Long-Haul Operation
Satellite Operation
Worst Case Line Quality
Error Protection Protocol
CRT or PC/Host Usage
Independent Stat Mux Printer Channel
Communications Software
Batch File Transfer Only
Networks Compatibility
Reliability of Long-Haul Throughput
Warranty

IT'S YOUR CHOICE
1-800-527-1169

ADCoMM 96/48 H

MICROCOM AX/9624c



Carterfone Communications Corporation
CABLE & WIRELESS

1341 WEST MOCKINGBIRD LANE • SUITE 1100 WEST • DALLAS, TEXAS 75247 • (214) 630-9700

Digital has it now.

The best way to bring all your users together. Today.

As computer systems multiply, so do the problems of sharing information among the people who use them.

Each system has its own operating software. Its own way of representing data. And its own way of communicating this data to the outside world. And as systems change to keep up with technological advances, the more users must struggle just to keep up.

But one computer company can bring all your users together. No matter how many vendors you're using.

At Digital, the ability to network computers is the cornerstone of our entire computing strategy. No wonder, then, that a Digital network can communicate with IBM mainframes and personal computers better than IBM can. Your users can exchange memos, mail, and documents directly. With no slowdowns from having to go through an intermediate computer.

And because *we've* planned for change, we can help *you* plan for it, too. You can upgrade to the latest, most cost-effective technology simply by plugging in new equipment. Without bringing down the network you already have. Without disrupting your entire organization.

Perhaps that's why our customers have made our Ethernet networks the most widely installed in the world—with over a half million users. For more than a decade, Digital's networks have been connecting the front office, the factory floor, the engineering center and the MIS department. And today, they're bringing entire companies together on a complete range of VAX™ desktop, departmental and large-scale computers.

Let us show you a Digital network in action at a company near you. Or at one of our 22 Applications Centers for Technology. Just call your local Digital sales office. And we'll show you how one company can bring all your computers together. Today.

digital™

©Digital Equipment Corporation, 1986. Digital, the Digital logo and VAX are trademarks of Digital Equipment Corporation.